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REMOVAL ACTION NO. 7 PLANT 1 PAD CONTINUING RELEASE - FINAL REPORT - DECEMBER 1994 - (LETTER IS DATED 02/16/95)

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REPORT

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

Removal Action No. 7
Plant 1 Pad Continuing Release

FINAL REPORT

December 1994

U.S. DEPARTMENT OF ENERGY

6593

Department of Energy
Fernald Environmental Management Project
P. O. Box 398705
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DOE-0579-95
FEB 16 1995

Mr. James A. Saric, Remedial Project Director
U.S. Environmental Protection Agency
Region V - 5HRE-8J
77 W. Jackson Boulevard
Chicago, Illinois 60604-3590

Mr. Tom Schneider, Project Manager
Ohio Environmental Protection Agency
401 East 5th Street
Dayton, Ohio 45402-2911

Dear Mr. Saric and Mr. Schneider:

TRANSMITTAL OF PLANT 1 PAD CONTINUING RELEASE REMOVAL ACTION NUMBER 7 FINAL REPORT

Enclosed is the Final Report for Removal Action Number 7, "Plant 1 Pad Continuing Release." This report is specified as the last milestone in the removal action work plan. Submittal of this document to the United States Environmental Protection Agency (U.S. EPA) completes Removal Action Number 7.

If you or your staff have any questions or comments regarding this document, please contact Art Murphy at (513) 648-3132.

Sincerely,

for Jack R. Craig
Fernald Remedial Action
Project Manager

FN:Murphy

Enclosure: As Stated

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Removal Action No. 7
Plant 1 Pad Continuing Release

FINAL REPORT

Fernald Environmental Management Project

December 1994

U.S. DEPARTMENT OF ENERGY

6593

CONTENTS

FIGURES

TABLES

ACRONYMS AND ABBREVIATIONS

AEDO	Assistant Emergency Duty Officer
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
DOE	U.S. Department of Energy
FEMP	Fernald Environmental Management Project
FERMCO	Fernald Environmental Restoration Management Corporation
FS	Feasibility Study
ft^3	cubic feet
HEPA	High Efficiency Particulate Air
HSL	Hazardous Substances List
IROD	Interim Record of Decision
MEF	Material Evaluation Form
NaI	sodium iodide
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NRC	Nuclear Regulatory Commission
NTS	Nevada Test Site
OAC	Ohio Administrative Code
OEPA	Ohio Environmental Protection Agency
OU3	Operable Unit 3
OU5	Operable Unit 5
PCB	polychlorinated biphenyl
pCi/g	picocuries per gram
PID	photoionization detector
ppb	parts per billion
ppm	parts per million
PVC	polyvinyl chloride
QA	quality assurance
QAPP	Quality Assurance Protection Plan
QC	quality control
RAWP	Removal Action Work Plan
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation

ABBREVIATIONS AND ACRONYMS (continued)

ROD	Record of Decision
RSE	Removal Site Evaluation
SAP	Sampling and Analysis Plan
SCQ	Sitewide CERCLA Quality Assurance Project Plan
SOP	Standard Operating Procedure
SVOC	semivolatile organic compound
TCLP	Toxicity Characteristic Leaching Procedure
UCL	Upper 95% Confidence Level
USEPA	U.S. Environmental Protection Agency
VOC	volatile organic compound
WEMCO	Westinghouse Materials Company of Ohio

EXECUTIVE SUMMARY

ES.1 BACKGROUND

The Plant 1 Pad is a concrete storage pad of approximately 461,000 square feet located north of Plant 1. The pad was used as a drum storage location to support sampling operations from 1952 to 1989. Materials that have been stored on the pad contained varying amounts of uranium, thorium, barium salts, waste oils containing 1,1,1-trichloroethane, and lead. Over time, some of the carbon steel drums used to store waste deteriorated as a result of extended exposure to the elements, increasing the risk of release of hazardous material to the environment. Additionally, sections of the pad were cracked and broken. The pad was not designed to contain stormwater runoff, allowing potentially contaminated stormwater runoff to spread to the adjacent soil and grassy area west of the pad.

In 1990, a Removal Site Evaluation (RSE) was conducted to determine whether the conditions at the Plant 1 Pad were sufficient to warrant a removal action under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Based upon the RSE, the U.S. Department of Energy (DOE) determined that a removal action was appropriate. The Removal Action Work Plan (RAWP) (WEMCO 1991) for the Plant 1 Pad Continuing Release (Removal Action No. 7) was approved by the U.S. Environmental Protection Agency (USEPA) in August 1991 and conditionally approved by the Ohio Environmental Protection Agency (OEPA) in April 1991. The Plant 1 Pad prior to Removal Action No. 7 is shown in Figure ES-1.

ES.2 DESCRIPTION OF REMOVAL ACTION NO. 7

Work began on Removal Action No. 7 in July 1991 and concluded on September 30, 1994. Removal Action No. 7 was conducted in three stages, which involved five phases of construction. The five phases (Phases A/B, C, D, and E) represent areas of construction as shown in Figure ES-2. A discussion of each stage of Removal Action No. 7 is provided below.

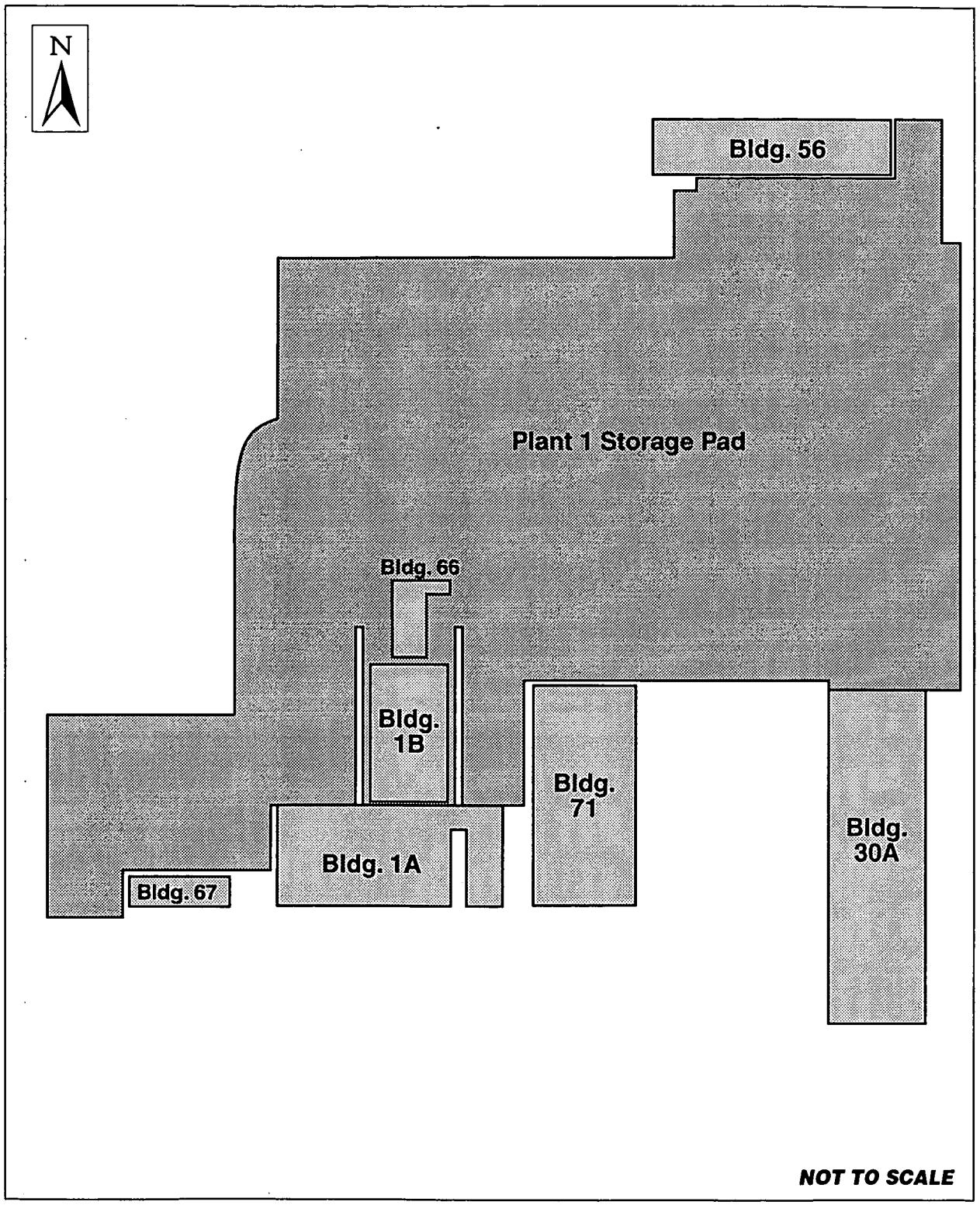

Figure ES-1. Plant 1 Storage Pad Prior to Removal Action.

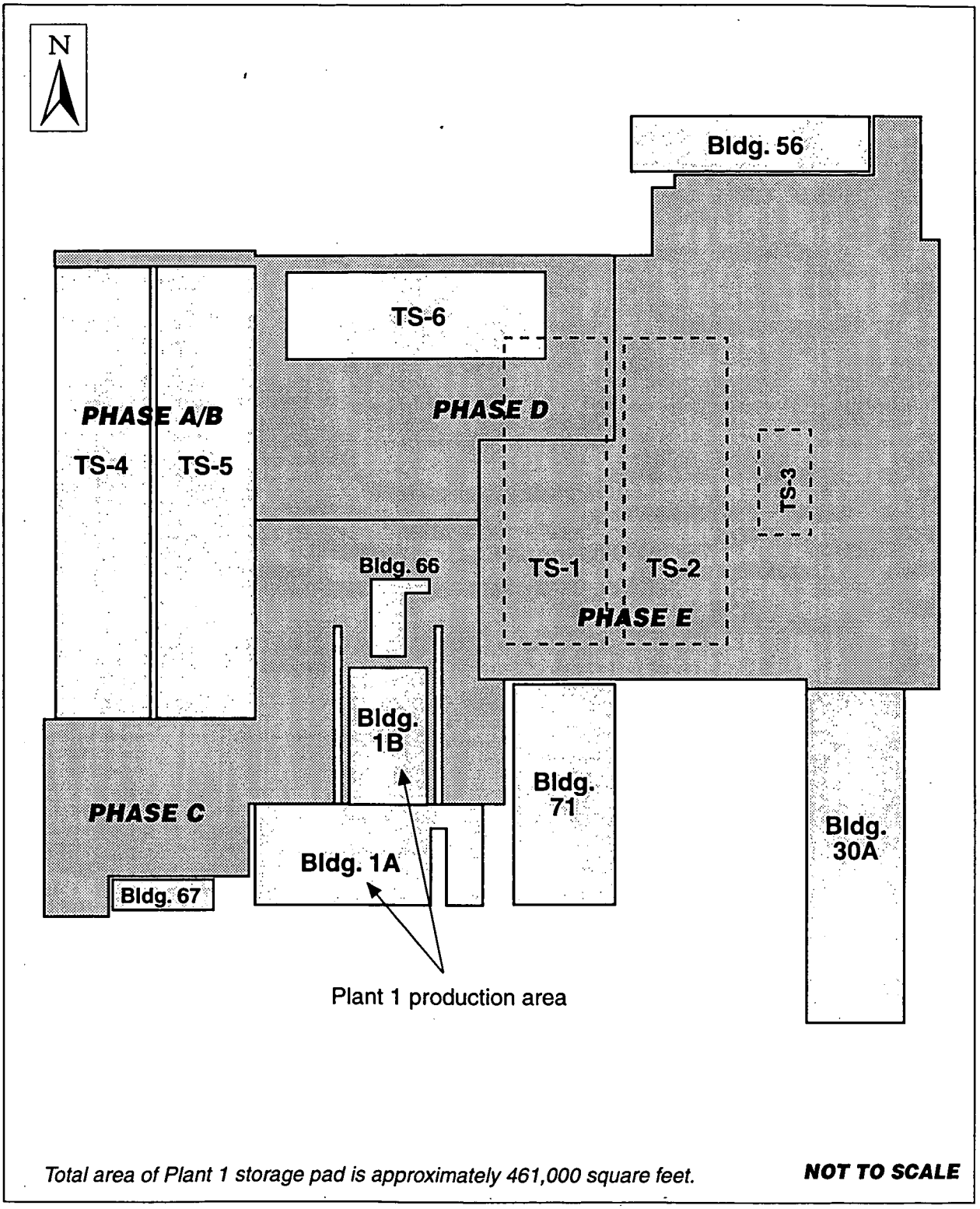

Figure ES-2. Plant 1 Pad Construction Phases.

Stage I took place from July 1991 to January 17, 1992 and involved the installation of a membrane on the west side of the pad to prevent potentially contaminated runoff from entering the soil. A partial perimeter curb was also installed to anchor the membrane, as well as to channel stormwater runoff. Stage I also involved soil sampling and analysis to characterize soils west of the Plant 1 Pad, prior to their excavation from the Phase A/B construction area during Stage II. Also, during Stage I, two 27,000-square-foot temporary tension support structures, TS-1 and TS-2, were erected in the Phase D and E construction areas to provide covered drum storage (Figure ES-2).

Stage II, which took place from February through December 1992, consisted of soil removal and new pad construction in the Phase A/B construction area. Radioactively contaminated soil from the Phase A area west of the Plant 1 Pad was removed to an activity level of 35 pCi/g total uranium, the Fernald Environmental Management Project (FEMP) build-over criteria at the time the Removal Action No. 7 work plan was written and approved. Following soil removal, new concrete sections were placed over the excavated area in Phase A. Soil sampling and analysis conducted prior to excavation determined that the soils to be excavated did not contain hazardous wastes.

The new concrete pad constructed in the Phase A area consisted of 86,000 square feet west of the pad, and a 7,000-square-foot overlap on the existing pad. The new pad surface was sealed with an 86 mil chemically resistant polyurethane wear surface. Phase B involved the placement of two tension support structures, TS-4 and TS-5, on the new pad surface in the Phase A area (Figure ES-2). Each structure provides approximately 40,000 square feet of covered, controlled permitted Resource Conservation and Recovery Act (RCRA) storage.

Stage III, which took place from May 1993 through September 1994, consisted of completing the remaining pad upgrades in the Phase C, D, and E areas. This involved the resurfacing and curbing of the existing Plant 1 Pad. An additional 22,500 square feet of covered controlled storage, TS-6, was constructed in the Phase D area (Figure ES-2). The new concrete surface and TS-6 were sealed and coated in the same manner as was done in Phase A/B. Because of the refinements of FEMP waste management plans, the use of the Phase E area was changed from the storage of containerized radioactive waste to also allow storage of surface decontaminated bulk material generated by the dismantling of buildings and structures at the FEMP. As a result, there was a need for a coating that would provide increased durability necessary for the

storage of bulk material. Surtreat® coating was identified as the preferred coating for the Phase E area, and was used in place of the 86 mil polyurethane coating used in the other phases of construction. USEPA was notified of this change and approved it on July 22, 1994. Phase E construction was completed September 30, 1994, completing Removal Action No. 7.

ES.3 CONCLUSIONS

The objective of Removal Action No. 7 was to mitigate the continuing release of contaminants from the Plant 1 Pad until final remediation.

As detailed in this final report, this objective was accomplished through 1) capping contaminated soil west of the pad with sealed concrete (Phase A/B), and 2) upgrading the remaining pad with placement of sealed concrete in Phases C, D, and E. The Removal Action No. 7 objective has therefore been fully met. In the event that further remediation is necessary, such actions will be conducted in accordance with the applicable Operable Unit Record of Decision (ROD).

In addition to mitigating the continuing release of contaminants from the Plant 1 Pad, Removal Action No. 7 has also provided an additional storage facility to meet the requirements of Ohio Administrative Code (OAC) 3745-65 and 40 Code of Federal Regulations (CFR) Part 265 for hazardous waste storage.

Consistent with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), Removal Action No. 7 contributed to the efficient performance of projected final remedial actions at the FEMP. The goals of the FEMP in conducting Removal Action No. 7 were to minimize the potential for releases of hazardous substances incidental to removal field operations, and to conduct the action in a cost efficient and safe manner consistent with site Standard Operating Procedures (SOPs) and worker health and safety requirements. These goals were achieved.

1.0 INTRODUCTION

The Plant 1 Pad, a concrete storage pad of approximately 461,000 square feet, located north of the Plant 1 Sampling Plant, was used for drum storage in support of sampling operations. The Plant 1 Pad (Figure 1-1) has been in use at the Fernald Environmental Management Project (FEMP) since 1952, and was the location for sampling large amounts of uranium metal process residues and waste materials. Materials that have been stored on the pad contained varying amounts of uranium metal (ingots and scrap), UO_3 (reactor recycle tails), UF_4, U_3O_8, and thorium (ThF_4 and ThO_2 high fluoride), as well as barium salts, waste oils contaminated with 1,1,1-trichloroethane, and lead. Some of the carbon steel drums that were used to store wastes on the pad deteriorated as a result of extended exposure to the elements, increasing the risk of release of hazardous material to the environment. In addition, sections of the pad had no curbs or sumps for containment of stormwater runoff, allowing potentially contaminated stormwater runoff to spread to the adjacent soil and grassy area west of the pad.

In 1990, the U.S. Department of Energy (DOE) authorized a Removal Site Evaluation (RSE) under authority delegated under Section 104 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), through Executive Order 12580. The RSE (Westinghouse Materials Company of Ohio [WEMCO] 1990a) was performed to determine whether the conditions at the Plant 1 Pad were sufficient to warrant a removal action under CERCLA, consistent with Section 300.410 of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). Based upon the RSE, the DOE determined that a removal action was appropriate and issued an Action Memorandum. The Removal Action Work Plan (RAWP) (WEMCO 1991) for the Plant 1 Pad Continuing Release (Removal Action No. 7) was approved by the U.S. Environmental Protection Agency (USEPA) in August 1991 and conditionally approved by the Ohio Environmental Protection Agency (OEPA) in April 1991. Work began in July 1991 and concluded September 30, 1994. The objective of Removal Action No. 7 was to implement interim actions to mitigate the continuing release of contaminants from the Plant 1 Pad until final remediation. Additionally, Removal Action No. 7 provided an additional storage facility to meet the requirements of Ohio Administrative Code (OAC) 3745-65 and 40 Code of Federal Regulations (CFR) Part 265 for hazardous waste storage.

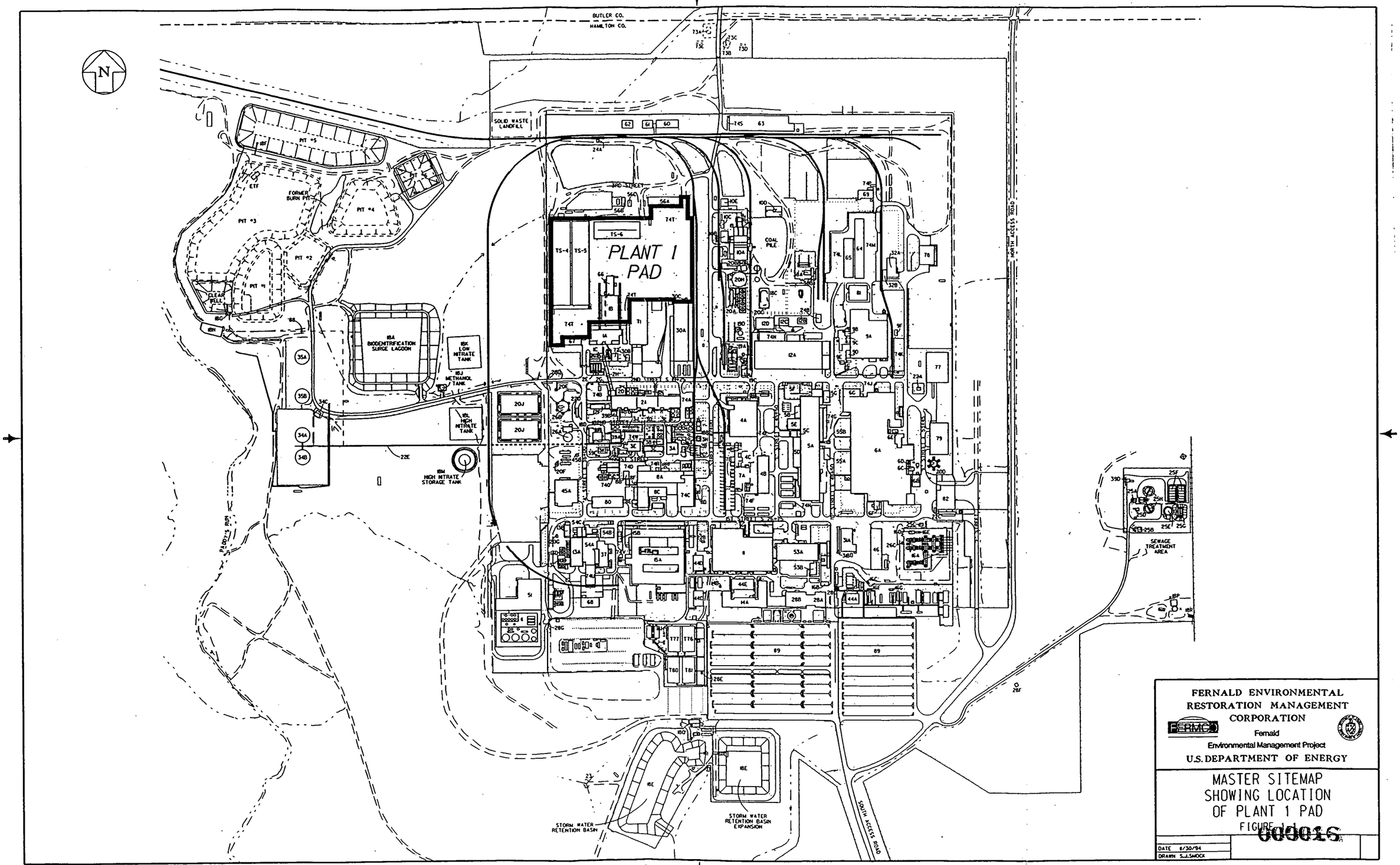

Figure 1-1. Master Grid Site Map Showing the Location of Plant 1 Pad.

Removal Action No. 7 involved three elements: 1) interim runoff control; 2) soil removal, new pad construction, and covered, controlled storage construction; and 3) installation of sealed concrete over existing contaminated concrete, and additional construction of covered, controlled storage.

A detailed description of Removal Action No. 7 is presented in Section 2.0. Section 3.0 presents conclusions and describes how the removal action objectives were accomplished, and Section 4.0 provides references. Analytical data collected during the removal action are presented in Attachment A.

2.0 DESCRIPTION OF THE REMOVAL ACTION

Prior to initiating Removal Action No. 7, contaminants from the Plant 1 Pad could have entered the environment via rainwater penetrating cracks in the pad and entering the soils below; runoff flowing directly into the storm sewer system; and unrestricted runoff flowing from the northwest side of the pad onto the adjacent soils. The objective of Removal Action No. 7 was to mitigate the continuing release of contaminants from the Plant 1 Pad until final remediation is performed under Operable Unit 3 (OU3) and Operable Unit 5 (OU5).

Removal Action No. 7 began in July 1991 and concluded September 30, 1994. Removal action activities followed FEMP Standard Operating Procedures (SOPs). Upon approval of the Sitewide CERCLA Quality Assurance Project Plan (SCQ) (FEMP 1992), removal action activities were conducted in accordance with the SCQ to provide consistency with other FEMP actions. All sampling events included the full implementation of quality assurance/quality control (QA/QC) procedures to ensure that high quality data were collected.

The RAWP divided Removal Action No. 7 into three schedule stages, with five construction phases (A through E), as follows:

1. Stage I—Installation of a membrane and a partial perimeter curb to provide interim runoff control, and erection of two temporary tension support structures, TS-1 and TS-2, to provide covered drum storage.

2. Stage II—Removal of radioactively contaminated soil to an activity level of 35 picocuries per gram (pCi/g) total uranium, new pad construction west of the existing pad (Phase A construction), and the installation of two tension support structures, TS-4 and TS-5 (Phase B construction).

3. Stage III—Construction of the remaining pad upgrades (Construction Phases C, D, and E).

The locations of the Phase A through E construction areas are shown in Figure ES-2. A chronological summary of the activities conducted during Removal Action No. 7 is presented in Table 2-1.

2.1 STORED DRUM MANAGEMENT

Prior to the start of Removal Action No. 7, the FEMP initiated a drum management program to minimize potential environmental impacts of stored drummed materials at the FEMP (WEMCO 1990b). As part of that program, the following actions were implemented to mitigate spills and leaks from drums on the Plant 1 Pad:

- Overpacking of deteriorated drums;
- Daily drum leakage inspections;
- Weekly inspections consistent with 40 CFR § 265.15 and § 265.174 and OAC 3745-66-15 and 3745-66-74;
- Operation of a lined staging area for deteriorated drums prior to overpacking;
- Relocation of a lined staging area for deteriorated drums prior to overpacking;
- Rearrangement of remaining Plant 1 Pad drums to provide adequate aisle space for leakage inspections;
- Expedited repair of the deteriorated pad to permit safe movement of the drums and achieve adequate aisle space. Repair consisted of filling in deteriorated sections of the pad, cutting away severely cracked areas, and subsequent replacement of the concrete. This repair was conducted in conjunction with the drum movements. Controls were used during the repair to minimize the spread of contamination and to drum the waste for subsequent characterization; and

Table 2-1. Removal Action No. 7 Chronology.

Date	General Actions	Construction Activities	Sampling Activities
November 1990	RSE submitted. DOE determines removal action is needed.		
March 26 - April 26, 1991			Field survey of preconstruction soil sample locations conducted.
April 3, 1991	RAWP conditionally approved by OEPA.		
June 1991	Final RAWP submitted to EPA.		Initial sampling conducted for Plant 1 Pad Continuing Release (18 locations).
July 29, 1991		Stage I construction begins following informal EPA approval.	
August 12, 1991		TS-1 and TS-2 installation begins. TS-3 already in place.	
August 19, 1991	USEPA written approval of RAWP received.		
October 1991	RCRA permit application revised to include Plant 1 Pad.		
November 5, 1991		Construction of stormwater line tie-in at Building 1B begins.	
December 1, 1991			18 additional samples collected at the 0- to 6-inch interval for Toxicity Characteristic Leaching Procedure (TCLP) analysis.
December 10, 1991		Field excavation for storm sewer line tie-in and catch basins begins.	
January 17, 1992	Stage I complete.		
February 3, 1992		Soil excavation from west side of pad begins.	
February 27, 1992		Continue containerizing Category III soils and moving Category II soils to 3rd Street stockpile.	
March 31, 1993			Post-excavation soil sampling conducted on south half of Phase A.
April 6, 1992		Begin placing concrete overlay on west side of existing Plant 1 Pad.	
April 8, 1992			Sampling completed on south half of Phase A. NE end was direct frisked.

Table 2-1. Removal Action No. 7 Chronology.

Date	General Actions	Construction Activities	Sampling Activities
April 15, 1992			Sampling of southern half of Phase A completed. Grids 76, 83, and 84 exceeded 35 pCi/g limit and will have to be excavated deeper to meet criteria for build-over.
April 23, 1992			NE quadrant of Phase A sampled.
April 27, 1992			An additional 6 inches of soil was excavated in grids 76, 83, and 84 for resampling.
April 30, 1992			Grids 76, 83, and 84 resampled. All grids were within acceptable limits.
May 1, 1992			Sampling results from NE quadrant of Phase A indicate all grids within acceptable limits, except Grids 12 and 59.
May 4, 1992			Grids 12 and 59 re-excavated, resampled, and found to be within acceptable limits.
May 13, 1992			Grids 13, 14, 17, 19, 20, 23, 29, and 35 surveyed and cleared for sampling.
May 21, 1992		Concrete placement continues for areas that have been sampled and cleared.	
May 27, 1992		Soil hauling to 3rd Street continues.	Rad and HNu frisking of northern half of Phase A conducted in preparation of sampling.
June 2, 1992			HNu analysis performed on Grids 9, 15, 21, 27 and 33.
June 3, 1992		Construction of forms and rebar mats begins along west field area. 150 yards of concrete placed along east and sides of south end of Phase A. Completed hauling soil to 3rd Street stockpile.	
June 9, 1992			Samples collected from north-central area of Phase A.
July 23, 1992		Concrete work continues on NW quadrant of Phase A.	
July 31, 1992		Backfilling for pad completed. Form and rebar work continues on north end of Phase A.	
August 3, 1992		Trusses for TS-4 and TS-5 arrive onsite.	

Date	General Actions	Construction Activities	Sampling Activities
August 5, 1992		Last concrete slab for pad placed during week (A total of 2345 cubic yards of concrete were placed).	
August 14, 1992		Begin truss erection for TS-4.	
September 4, 1992		Begin coating application.	
September 29, 1992		TS-6 structure delivered and stored (to be installed during Phase D).	
November 1, 1992		TS-4 installation complete.	
December 1, 1992		TS-5 installation complete.	
December 4, 1992	Stage II complete.		
May 26, 1993	It was determined that additional sampling of the Plant 1 Pad soil would not be required, as the soil will be managed in accordance with Removal Action No. 17, *Improved Storage of Soil and Debris*. Concrete will be boxed and shipped to Nevada Test Site (NTS), soil will be stockpiled.		
July 1993		Drum movements to clear areas in preparation for Phases C, D, and E completed.	
July 9, 1993		Construction contract awarded.	
July 19, 1993		Begin removing 107 feet of north end of TS-1 (to make room for TS-6).	
July 23, 1993	Fernald Environmental Restoration Management Corporation (FERMCO) submits letter to DOE stating that Removal Action No. 17 would be applied to the Plant 1 Pad Removal Action.		
August 16, 1993		Mobilization for Phases C, D, and E field work begins.	
August 23, 1993		First concrete pour in Phase C.	
November 23, 1993		TS-6 erection begins.	
December 10, 1993		Application of exterior coating stopped until spring of 1994 due to cold temperatures.	
February 4, 1994		Drums moved from Phase E into TS-4 and TS-5.	

Table 2-1. Removal Action No. 7 Chronology.

Date	General Actions	Construction Activities	Sampling Activities
May 31, 1994		Commence moving drums onto Area C.	
June 1, 1994		Coatings on Phases C and D completed. Movement of approximately 30,000 drums from Phase E to Phases C and D commences.	
June 8, 1994	Groundwater technicians noted flush mounts of monitoring wells 1342, 1345, 1348, and 1361 were inadvertently covered with "rubber" sealant.		
June 13, 1994	Sealant cut away from monitoring wells 1342, 1345, 1348, and 1361. Wells 1342 and 1348 contaminated by sealant.		
June 14, 1994	Contamination of wells 1342 and 1348 reported to Assistant Emergency Duty Officer (AEDO).		Wells 1342, 1345, 1348, and 1361 were sampled, purged, and resampled.
June 28, 1994		TS-1 removal begins.	
July 1, 1994		TS-1 removal completed. TS-2 dismantlement begins.	
July 21, 1994		TS-1, TS-2, and TS-3 removal completed.	
August 2, 1994	FERMCO submits letter to DOE stating need for coating design re-evaluation for Phase E.		
September 1, 1994	Surtreat® identified as suitable coating for Phase E.		
September 8, 1994	Eight wells in Phase E have been abandoned. No further groundwater monitoring under Plant 1 Pad to be conducted.	Concrete placed for Phase E.	
September 30, 1994	Removal Action No. 7 complete.	Concrete placement and Surtreat® application for Phase E complete.	

- Erection of a 6,226-square-foot tension support structure (TS-3) on the Plant 1 Pad as a demonstration project for storing and staging of contaminated materials/containers.

The above actions were performed as a supplement to Removal Action No. 7, in accordance with FEMP SOPs, followed the Stipulated Amendment to the Consent Decree commitments, and resulted in substantial environmental improvement at the FEMP from improved management of wastes.

2.2 STAGE I—INSTALLATION OF A MEMBRANE AND PARTIAL PERIMETER CURB

Stage I of Removal Action No. 7 encompassed the collection and analysis of soil samples from the area west of the Plant 1 Pad, in preparation for soil excavation during Stage II (Section 2.3), and the installation of a membrane and partial perimeter curb on the pad. Section 2.2.1 discusses the pre-excavation soil sampling conducted, and Section 2.2.2 discusses Stage I construction activities.

2.2.1 Pre-excavation Soil Sampling

Prior to Stage I construction, a field radiation survey of soil sample locations was conducted in the grassy area west of the Plant 1 Pad. The objectives of the soil sampling were to identify areas that required excavation based on the FEMP construction build-over criteria of 35 pCi/g total uranium, and to determine whether the excavated soil would require management as hazardous waste. This survey identified 18 locations west of the Plant 1 Pad, P1P 45 through P1P 62 (Figure 2-1), for pre-excavation soil sampling to provide additional radiological data and to determine the possible presence of Hazardous Substance List (HSL) constituents. Each location was sampled at four depth increments: 0 to 6 inches, 6 to 12 inches, 12 to 18 inches, and 18 to 24 inches.

The RAWP indicated that the samples collected from the 0- to 6-inch interval were to be analyzed for full metals (including Toxicity Characteristic Leaching Procedure [TCLP] metals), isotopic thorium, isotopic uranium, radium-226, and radium-228. If field photoionization detector (PID) measurements indicated the presence of volatile organic vapors, the samples were also to be analyzed for organic compounds. The full list of

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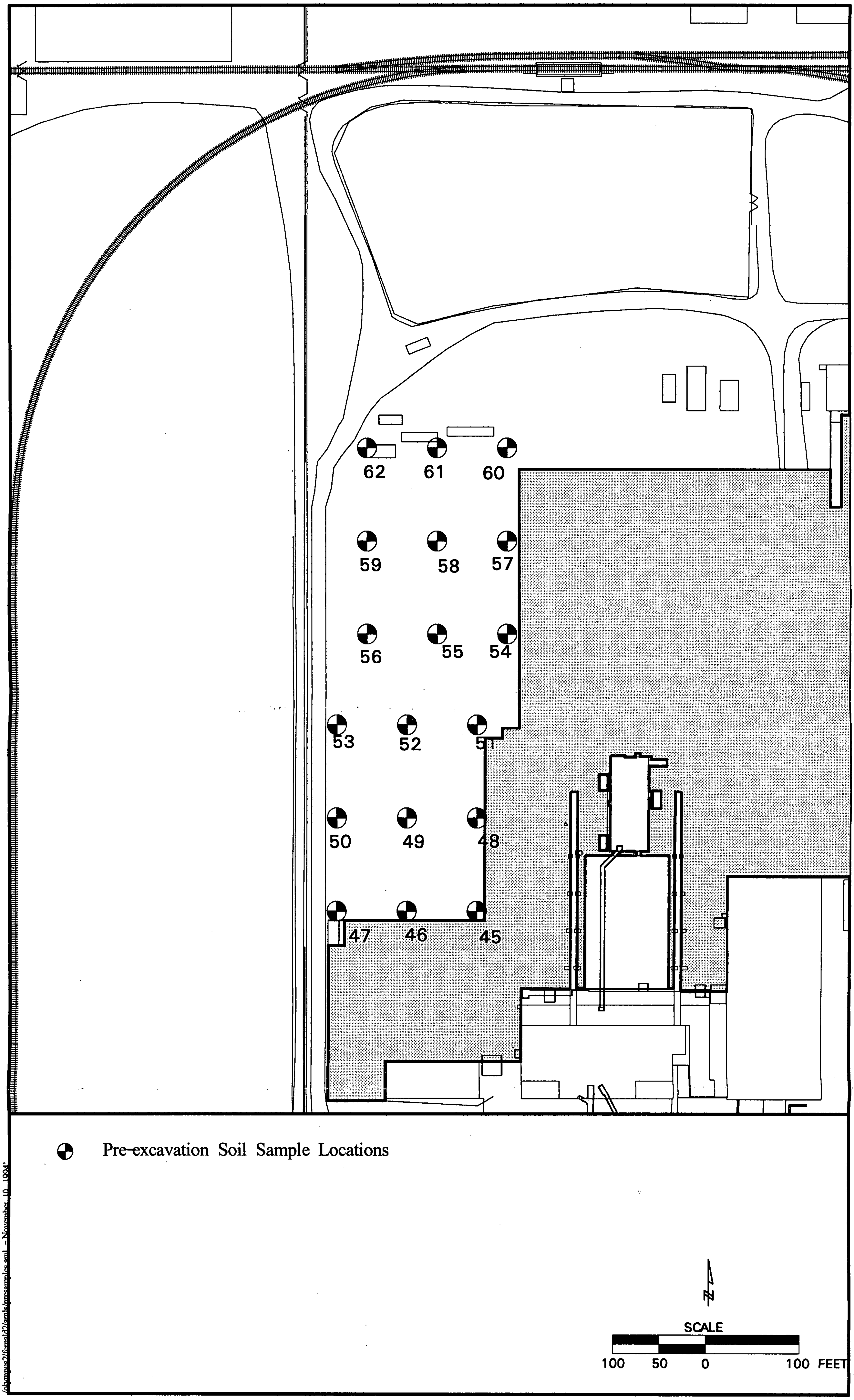

Figure 2-1. Pre-excavation Soil Sampling Locations.

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potential analytes is presented in Table 2-2. Based on the PID results, it was determined that organic analyses were not required. It was further determined that direct real-time measurements with a sodium iodide (NaI) radiation detector would be more effective than laboratory analyses in providing guidance for excavation of soil contaminated with uranium. Therefore, the samples were not analyzed for isotopic thorium, isotopic uranium, radium-226, and radium-228. However, the samples collected from the 0- to 6-inch interval were analyzed for pesticides and polychorinated biphenyls (PCBs), in addition to the metals. TCLP metals analysis was not initially conducted, because the total metals analyses indicated concentrations too low to exceed TCLP regulatory levels. Analytical results of samples collected from the 0- to 6-inch interval are provided in Attachment A, Table A-1. This table lists only those analytes that were above detection limits. It should be noted, however, that a number of these results reflect the presence of contamination in the associated sample blank. Although these results are presented in Table A-1, they have been disregarded in subsequent evaluations of the data in accordance with the SCQ.

A summary of analytical results from the 0- to 6-inch interval is presented in Figure 2-2. This figure shows the number of inorganic detections found at each sample location. In addition, the figure is colored according to the highest concentration of inorganic compounds detected at each sample location. No pesticides were detected in any of the samples. Trace quantities of Aroclor-1254 were detected at each of the sample locations; however, because of deficiencies in data quality, the detection is estimated for all samples, as shown in Table A-1.

Samples collected from the 6- to 12-inch and 12- to 18-inch intervals were originally archived for potential analysis in the event that elevated organic readings were detected in the field or in subsequent laboratory analyses. However, these samples eventually exceeded the holding time for volatile organic compounds (VOCs) and were not analyzed.

Samples collected from the 18- to 24-inch interval were analyzed for VOCs and semivolatile organic compounds (SVOCs), and analytical results are presented in Attachment A, Table A-2. This table lists only those analytes that were detected. A summary of SVOC analytical results from the 18- to 24-inch interval is presented in Figure 2-3. Like Figure 2-2, Figure 2-3 shows the number of SVOC detections found at each sample location. No positive detections of VOCs were observed.

Table 2-2. Analyte List.

Radionuclides

gross alpha
gross beta
Cesium-137
Neptunium-237
Plutonium-238
Plutonium-239/240
Radium-226
Radium-228
Strontium-90
Technetium-99
Thorium (total)
Thorium-228
Thorium-230
Thorium-232
Uranium (total)
Uranium-234
Uranium-235
Uranium-236
Uranium-238

Inorganics

Aluminum
Antimony
Arsenic
Barium
Beryllium
Cadmium
Calcium
Chromium
Cobalt
Copper
Cyanide
Iron
Lead
Magnesium
Manganese
Mercury
Molybdenum
Nickel
Potassium
Selenium
Silicon
Silver
Sodium
Thallium
Vanadium
Zinc

Volatile Organics

1,1-Dichloroethane
1,1-Dichloroethene
1,1,1-Trichlorethane
1,1,2-Trichloroethane
1,1,2,2-Tetrachlorolethane
1,2 Dichloroethene (total)
1,2-Dichloroethane
1,2-Dichloroethylene
1,2-Dichloropropane
2-Butanone
2-Hexanone
4-Methyl-2-pentanone
Acetone
Benzene
Bromodichloromethane
Bromoform
Bromomethane
Carbon disulfide
Carbon tetrachloride
Chlorobenzene
Chloroethane
Chloroform
Chloromethane
cis-1,3-Dichloropropene
Dibromochloromethane
Ethylbenzene
Methylene chloride
Styrene
Tetrachloroethene
Toluene
Xylenes (total)
trans-1,3-Dichloropropene
Tricholoroethene
Vinyl chloride

Semi-Volatile Organics

1,2-Dichlorobenzene
1,2,4-Trichlorobenzene
1,3-Dichlorobenzene
1,4-Dichlorobenzene
2-Chloronaphthalene
2-Chlorophenol
2-Methylnaphthalene
2-Methylphenol
2-Nitroaniline
2-Nitrophenol
2,4-Dichlorophenol
2,4-Dimethylphenol
2,4-Dinitrophenol
2,4-Dinitrotoluene
2,4,5-Trichlorophenol
2,4,6-Trichlorophenol
2,6-Dinitrotoluene
3-Nitroaniline
3,3-Dichlorobenzidine
4-Bromophenyl-phenyl ether
4-Chloro-3-methylphenol
4-Chloroaniline
4-Chlorophenol-phenyl ether
4-Methylphenol
4-Nitroaniline
4-Nitrophenol
4,4'-DDD
4,4'-DDE
4,4'-DDT
4,6-Dinitro-2-methylphenol
Acenaphthene
Acenapthylene
Anthracene
Benzo(a)anthracene
Benzo(a)pyrene
Benzo(b)fluoranthene
Benzo(g,h,i)perylene
Benzo(k)fluoranthene
Benzyl alcohol

Table 2-2. Analyte List

bis(2-Chloroethoxy) methane	***Pesticides/PCBs***
bis(2-Chloroethyl)ether	Aldrin
bis(2-Chloroisopropyl) ether	Aroclor-1016
bis(2-Ethylhexyl) phthalate	Aroclor-1221
Butylbenzylphthalate	Aroclor-1232
Carbazole	Aroclor-1242
Chrysene	Aroclor-1248
Dibenzofuran	Aroclor-1254
Dibenzo(a,h)anthracene	Aroclor-1260
Diethylphthalate	Dieldrin
Dimethylphthalate	Endosulfan II
Di-n-butyl phthalate	Endosulfan sulfate
Di-n-octyl phthalate	Endosulfan I
Fluoranthene	Endrin
Fluorene	Endrin aldehyde
Hexachlorobenzene	Endrin ketone
Hexachlorobutadiene	Heptachlor
Hexachlorocyclo pentadiene	Heptachlor expoxide
Hexachloroethane	Methoxychlor
Indeno(1,2,3-cd)pyrene	Toxaphene
Isophorone	alpha-BHC
Naphthalene	alpha-Chlordane
Nitrobenzene	beta-BHC
N-Nitroso-di-n- propylamine	delta-BHC
N-Nitrosodiphenylamine	gamma-BHC (Lindane)
Pentachlorophenol	
Phenanthrene	
Phenol	
Pyrene	

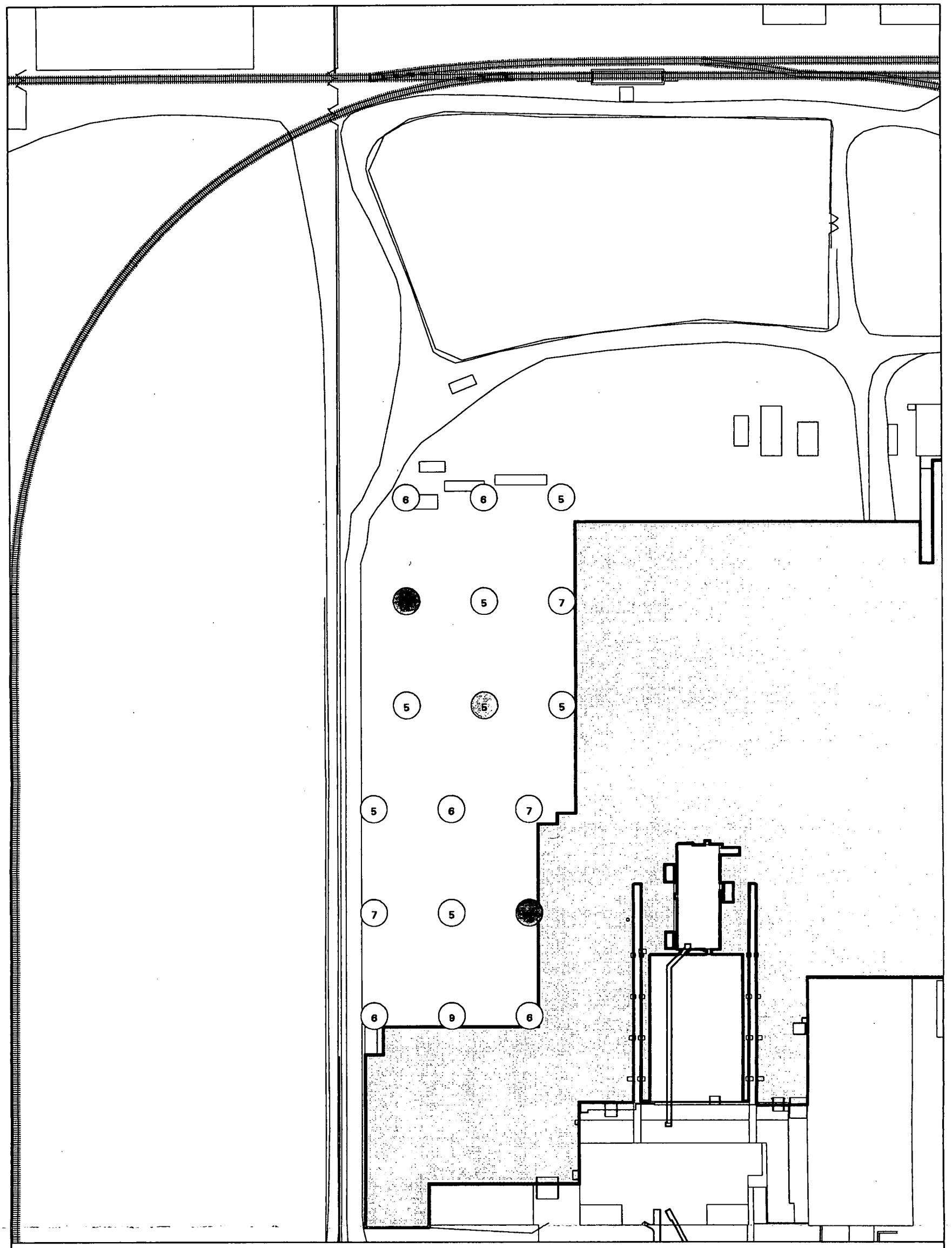

Figure 2-2. Pre-excavation Inorganic Detections at the 0- to 16-inch Interval.

The RAWP specified that additional samples were to be collected from four locations around any sample points with sufficiently elevated concentrations of contaminants (25 feet north, south, east, and west of the original location). However, analysis of the pre-excavation soil samples did not reveal concentrations of contaminants that warranted additional sampling.

The RAWP stated that where analytical results from the 0- to 6-inch interval showed any HSL analyte present in concentrations greater than background, the data would be statistically assessed. It further stated that for total metals, if the mean plus two standard deviations was less than the TCLP regulatory threshold, no further analyses would be performed, and where the regulatory threshold levels were exceeded, the archived samples (6- to 12-inch and 12- to 18-inch intervals) would be submitted for analysis of the specific analytes. However, as previously stated, the total metals were detected at concentrations too low to exceed the TCLP regulatory levels, so the archived samples were not analyzed.

In October 1991, a Sampling and Analysis Plan (SAP) Addendum for pre-excavation and post-excavation soil sample analyses for Removal Action No. 7 was submitted, and was approved by the DOE in November 1991 (Advanced Sciences Inc./International Technology Corporation [ASI/IT] 1991). Since the original pre-excavation sample analyses did not include TCLP metals analyses, as required by the RAWP, the addendum specified that the required metals analysis be performed on samples archived from the pre-excavation sampling. Although the SAP addendum stated that the analyses would be conducted on the archived soils from the 0- to 6-inch interval of sample locations P1P 45 through P1P 62, new soil samples were collected and analyzed for TCLP metals in December 1991. These samples (61525 through 61542) were used to develop Resource Conservation and Recovery Act (RCRA) determinations for soil to be excavated from the Phase A/B area. Based on these results, the soil was determined not to contain hazardous waste. A summary of the TCLP metal analytical results is provided in Attachment A, Table A-3.

2.2.2 Stage I Construction

Stage I of Removal Action No. 7 involved the installation of a membrane and partial perimeter curb on the northwest side of Plant 1 Pad that continued into the grassy area

west of the pad. The membrane prevented stormwater runoff from coming into direct contact with contaminants present in the surface soils along the western edge of the pad. The membrane also provided runon control for soil removal and new pad construction in the Phase A area during Stage II of the removal action by acting as a clean surface to channel runoff. The curb was installed to help channel the stormwater runoff, as well as to anchor the membrane. After the contaminated soils were removed from the Stage II area, the membrane continued to control runoff in the excavation area until the concrete for the new pad sections was placed.

During Stage I, two temporary tension support structures were installed on the existing Plant 1 Pad (Phase D and E area) to provide covered, controlled storage for 18,000 drums from the removal action area. These structures, TS-1 and TS-2, were erected in August 1991, and were used until July 1994 (Figure 2-4). Each structure occupied approximately 27,000 square feet. Upon completion of Stage I, the secured drums were moved to these structures.

Additionally, during Stage I, construction of the stormwater line tie-in at Building 1B and construction of catch basins began. This tie-in provided the new Plant 1 Pad area with a drainage system to collect spills and washwater. The Plant 1 Pad drainage system, which has no connection to other FEMP site drainage systems, transports the collected liquids to the General Sump, where the wastewater is treated and discharged to Manhole 175.

Stage I construction activities were completed on January 17, 1992, almost 2 months ahead of the scheduled completion date of March 13, 1992.

2.3 STAGE II—SOIL REMOVAL AND PHASE A/B CONSTRUCTION

Stage II of Removal Action No. 7 involved the removal of contaminated soils west of the Plant 1 Pad prior to new pad construction. In accordance with the RAWP, soil was excavated until the build-over criteria of 35 pCi/g total uranium was reached. A discussion of the soil removal criteria is provided in Section 2.3.1. Section 2.3.2 provides a summary of the post-excavation sampling that was conducted. Section 2.3.3 provides a discussion of Phase A/B construction activities, and Section 2.3.4 summarizes management and disposition of waste generated during Phase A/B construction.

Figure 2-4. Erection of TS-2 During Stage I of Removal Action No. 7, Looking Northwest.

2.3.1 Soil Removal Criteria

The RAWP method for addressing the contaminated soil adjacent to the Plant 1 Pad was based on the Nuclear Regulatory Commission (NRC) Branch Technical Position criteria and is consistent with the Remedial Investigation/Feasibility Study (RI/FS) objectives. The Branch Technical Position criteria that apply to Removal Action No. 7 are as follows:

U-238	35 pCi/g
U-234, 235	30 pCi/g
Th-232	10 pCi/g
Th-228, 230	10 pCi/g
Ra-228	10 pCi/g.

Because depleted uranium, (dominated by uranium-238 [U-238]), is the principle form of uranium at the Fernald Site, 35 pCi/g total uranium was considered the appropriate action level for soil removal at the time the Removal Action No. 7 Work Plan was written and approved.

Sampling and analyses were conducted to ensure the soil build-over criteria were achieved. However, during the course of the removal action, Removal Action No. 17, *Improved Storage of Soil and Debris* (FERMCO 1992), was approved and incorporated into Removal Action No. 7 as the appropriate guidance for management of excavated soil. Although the build-over criteria were met prior to construction of the new pad (Section 2.3.2), in accordance with the newly approved Removal Action No. 17, and because the Plant 1 Pad was not intended to be a permanent structure, additional soil excavation was not actually required. In the event that additional soil remediation is required, it will be conducted under the OU5 ROD.

2.3.2 Post-excavation Soil Sampling

In February 1992, Stage II work began with the excavation of 1 foot of soil west of the Plant 1 Pad. During excavation, portable instruments were used to measure organic vapors and radiological contaminants. Soil containing radioactivity levels between 35 and 100 pCi/g total uranium was stockpiled in the Third Street stockpile, and soil

containing activities greater than 100 pCi/g total uranium was placed in white metal boxes and stored pending final disposition.

After removing the first foot of soil, walk-over surveys of the excavated area were performed with a 2 by 2 NaI scintillation radiation detector. The probe of the detector was moved back and forth over the surface of the soil. Areas that indicated activity greater than 15 percent above background were excavated another 6 inches and were re-surveyed to make sure the soil was at background levels.

When the base of the excavation was established, a 10 by 10 meter grid was laid out as shown in Figure 2-5. The study area comprised 90 grids. Each grid square was divided into four quadrants (NE, SE, SW, and NW) with sampling locations in the center of each quadrant. The four samples from each grid were collected and assigned four unique sample numbers, then they were transferred to the WEMCO laboratory where they were composited, and an aliquot of the sample was extracted for total uranium and total thorium analyses. These total uranium results were used to determine if the build-over criteria had been achieved.

Twenty-five percent of the composited samples, randomly chosen by the sampling subcontractor, ASI/IT, were split for additional analyses. Those split samples were analyzed for full HSL metals and full radiological parameters. Additional, grab samples were collected from the northeast corner of each of the randomly selected grids, and were analyzed for HSL VOCs, SVOCs, pesticides, and PCBs. The grids selected for further analyses are shown on Figure 2-5. A complete list of radiological and hazardous constituents analyzed is provided in Table 2-2.

Once sampling activities began, it was determined that Grids 1 through 6 were located outside of the Phase A/B construction area so sampling of these grids was not performed. However, as stated previously, all other grids were sampled for total thorium and total uranium to determine if the build-over criteria of 35 pCi/g total uranium had been achieved.

Upon initial analysis of all grid samples for total thorium and total uranium, Grids 12, 59, 76, 83, and 84 were found to exceed the build-over criteria of 35 pCi/g total uranium. These grids were then excavated an additional 6 inches and resurveyed with the NaI scintillation probe and PID. Grid 12 continued to have a high total uranium

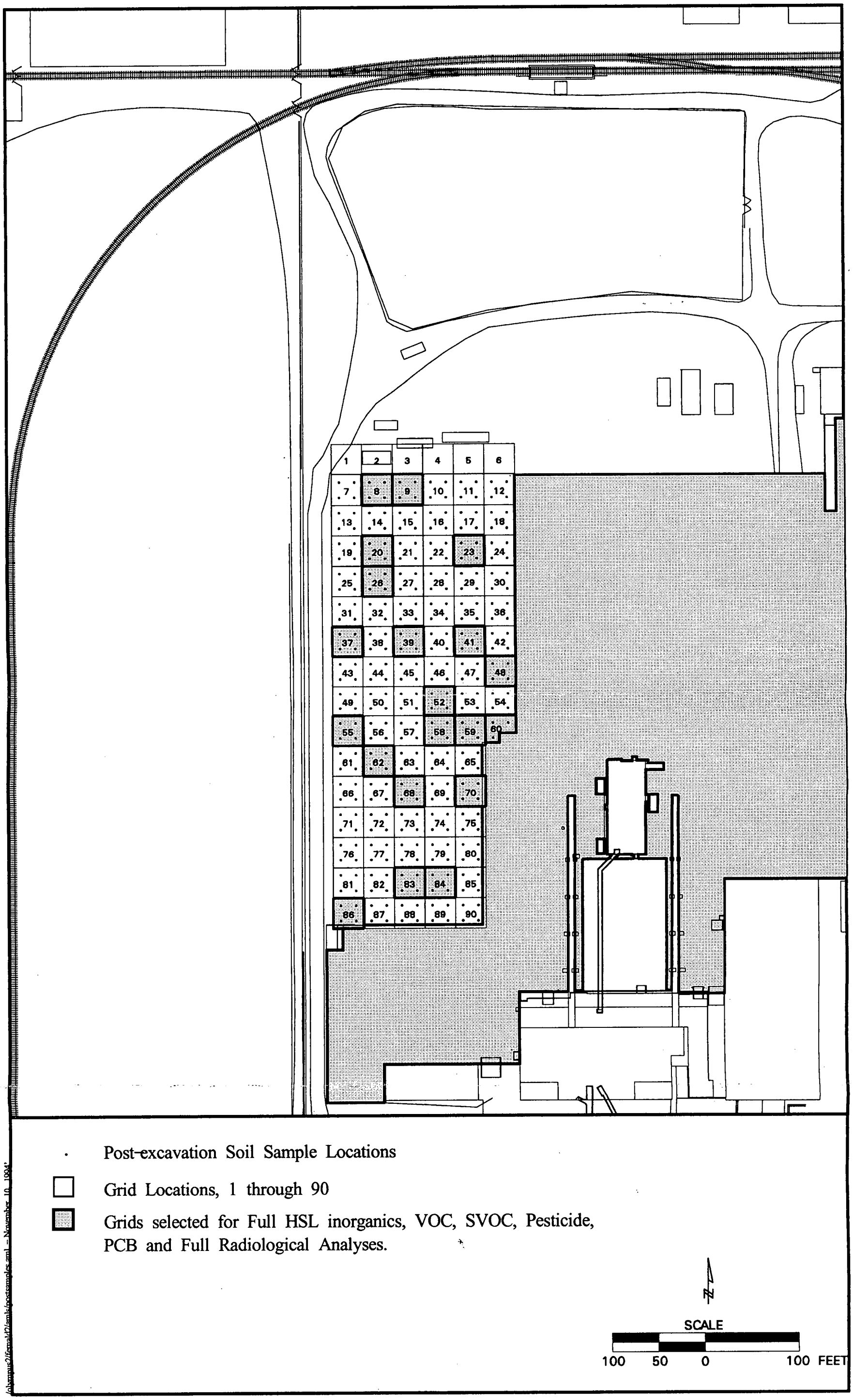

Figure 2-5. Post-excavation Soil Sampling Locations.

activity, and was re-excavated. After resampling, all five grids were found to be within build-over criteria limits. Analytical results from total thorium and total uranium analyses are provided in Attachment A, Table A-4. A summary of the distribution of total uranium detected after all excavation and sampling activities were completed is provided in Figure 2-6.

The composited samples that were randomly selected from 25 percent of the grids were analyzed for full inorganic and radiological constituents. The results of these analyses are provided in Attachment A, Table A-5. The concentrations of inorganics and radionuclides detected were compared to the Upper 95% Confidence Level (UCL) concentrations. UCLs at the FEMP are available for inorganics and radionuclides at the 0- to 6-inch depth and the 48- to 54-inch depth. For comparison, these UCLs are provided in Table A-5, along with the inorganic and radionuclide analytical results from the composited samples. Table A-5 shows a wide range of inorganic concentrations between the surface and subsurface soils. Analytical results from samples collected west of the Plant 1 Pad also show a wide range of inorganic concentrations, indicating that the soils may have been disturbed during previous construction activities. Table A-5 shows inorganic detections greater than the UCL in bold. A summary of the range and distribution of inorganic detections greater than the UCL is provided in Figure 2-7.

As shown in Figure 2-7, only five inorganic compounds were detected above the UCLs: aluminum, calcium, copper, silicon, and zinc. Aluminum, calcium, and silicon are ubiquitous in soils and were detected at concentrations only slightly higher than the UCLs. Copper detections above the UCL of 18.55 parts per million (ppm) were found in eight grids with concentrations ranging from 18.9 to 33 ppm, and zinc was detected in four grids above the UCL of 68.54 ppm with levels ranging from 75.4 to 218 ppm.

Radionuclide detections above UCLs for composite samples are also shown in Attachment A, Table A-5. A summary of the results, showing the distribution of strontium-90, technetium-99, and plutonium-239, detections greater than UCL is shown in Figure 2-8. Other radionuclides detected above UCL included neptunium-237, cesium-137, radium-226, and radium-228. These radionuclides were detected above the UCL in only one grid, Grid 86, with levels of 0.11, 4.26, 25.2 and 12.1 pCi/g, respectively. Isotopes of thorium and uranium were also detected in the full radionuclide analyses. In the case of Grids 12, 59, 76, 83, 84, and 62, the full radionuclide analyses indicated concentrations of uranium that differed (both higher and

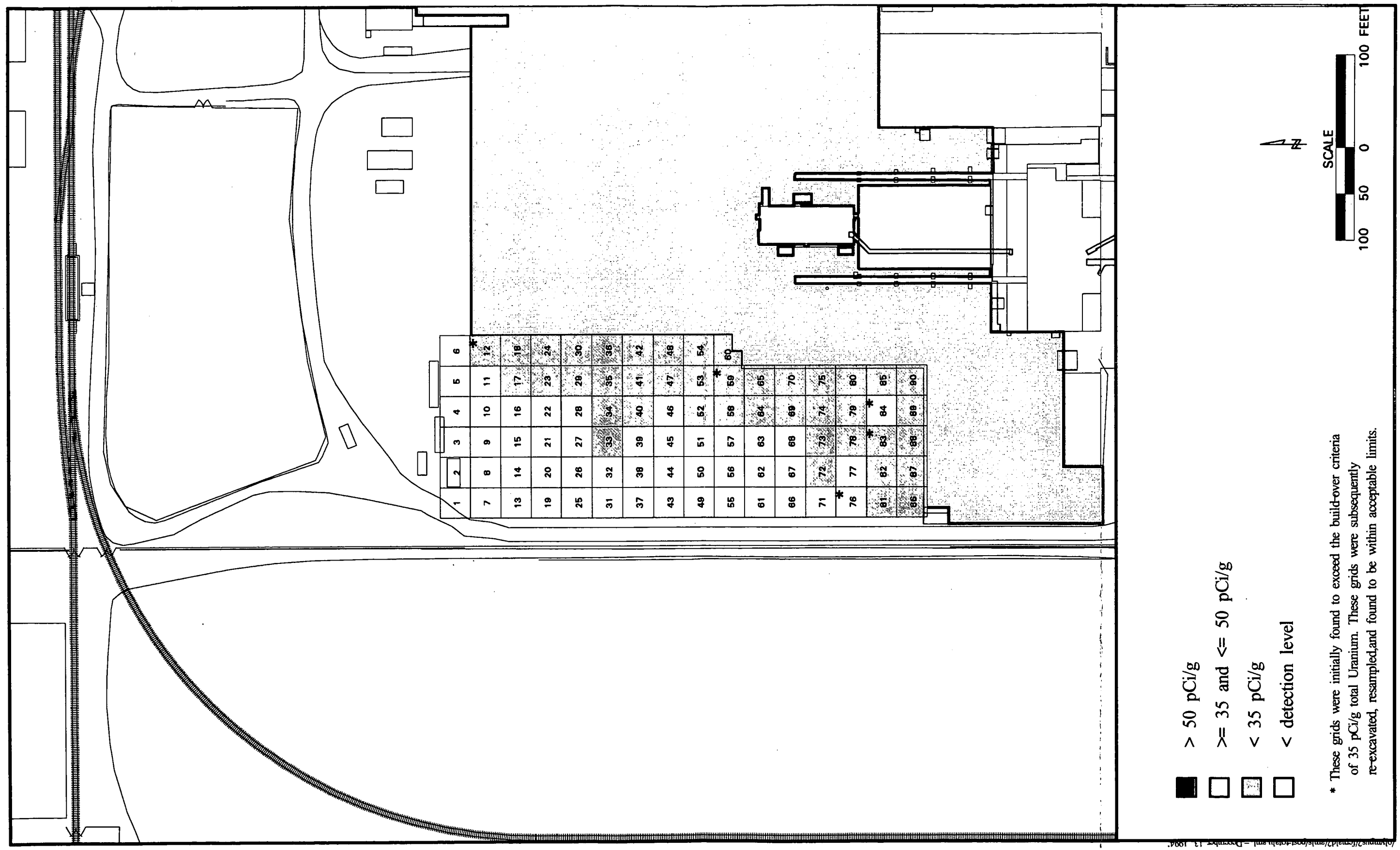

Figure 2-6. Total Uranium Distribution in Post-excavation Grids.

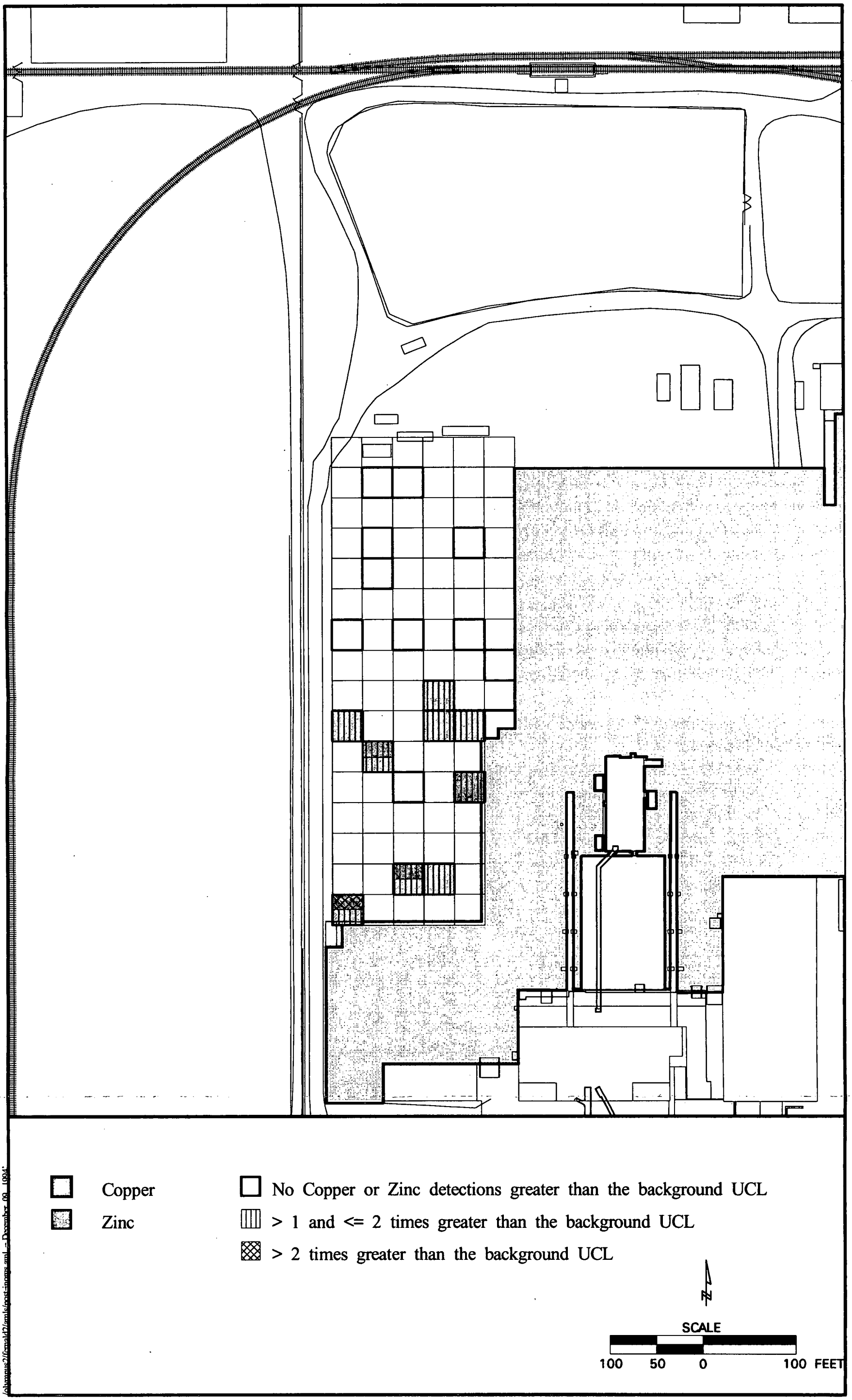

Figure 2-7. Distribution of Inorganic Detections in Post-excavation Composite Samples.

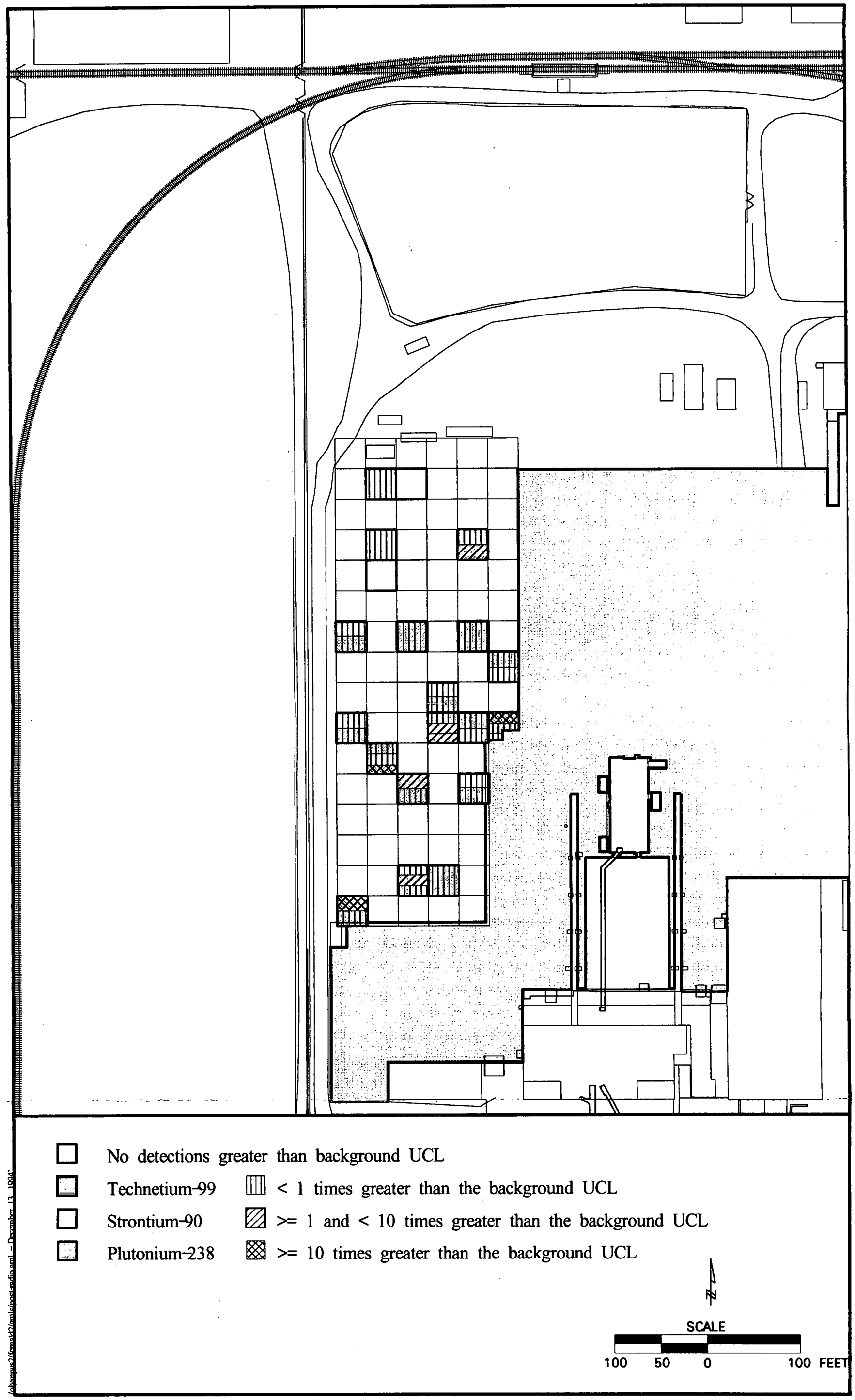

Figure 2-8. Distribution of Radionuclide Detections in Post-excavation Composite Samples.

lower) from the FEMP total uranium results. However, consistent with the RAWP, excavation decisions were based on the total uranium detections from each of the 84 sampled grids. In the event that additional soil remediation is required, it will be conducted under the OU5 ROD.

The grab samples collected from 25 percent of the grids were analyzed for HSL organics, mercury, and cyanide, as previously stated. The results of these analyses are provided in Attachment A, Table A-6. Results indicate Grid 60 had the highest level of VOC detections with 12,000 parts per billion (ppb) 1,1-dichloroethene, 9,100 ppb benzene, 9,000 ppb chlorobenzene, 49,000 ppb tetrachloroethene, 8,300 ppb toluene, and 8,900 ppb trichloroethene. A summary of the distribution and range of VOCs is shown in Figure 2-9. Also, as shown in Table A-6, SVOCs were detected in seven grids with the highest concentrations in Grids 8 and 58. The highest concentrations of SVOCs detected in these two grids include 1,2,4-trichlorobenzene, 1,4-dichlorobenzene, 2,4-dinitrotoluene, 2-chlorophenol, 4-chloro-3-methylphenol, 4-nitropheneol, and acenaphthene, with concentrations ranging from 860 to 2,300 ppb. A summary of the SVOC distribution is presented in Figure 2-10. Pesticides and PCBs were detected in 14 of the randomly sampled grids. The summary of the pesticide and PCB distribution is presented in Figure 2-11. These figures show the number of positive VOC, SVOC, or pesticide/PCB detections in each grid. Additionally, the grids are colored according to the concentration of the peak detection in each grid. In addition to the VOCs, SVOCs, pesticides, and PCBs, mercury was detected at a concentration of 0.14 ppm in Grid 9. Cyanide was not detected in any of the grids.

2.3.3 Phase A/B Construction

Construction of the new concrete pad and placement of tension support structures TS-4 and TS-5 during Phase A/B was initiated after contaminated soil west of the pad was removed to the excavation action levels for total uranium. During soil removal, an excavated area would be surveyed and sampled while other areas were still undergoing excavation. When sampling results indicated the area was below the soil excavation criteria of 35 pCi/g total uranium (Attachment A, Table A-4), the area was deemed ready for build-over, and concrete placement began. This process of excavating, surveying, sampling, and concrete placement continued for approximately 5 months. In August 1992, the last slab of concrete for the new pad construction in Phase A was

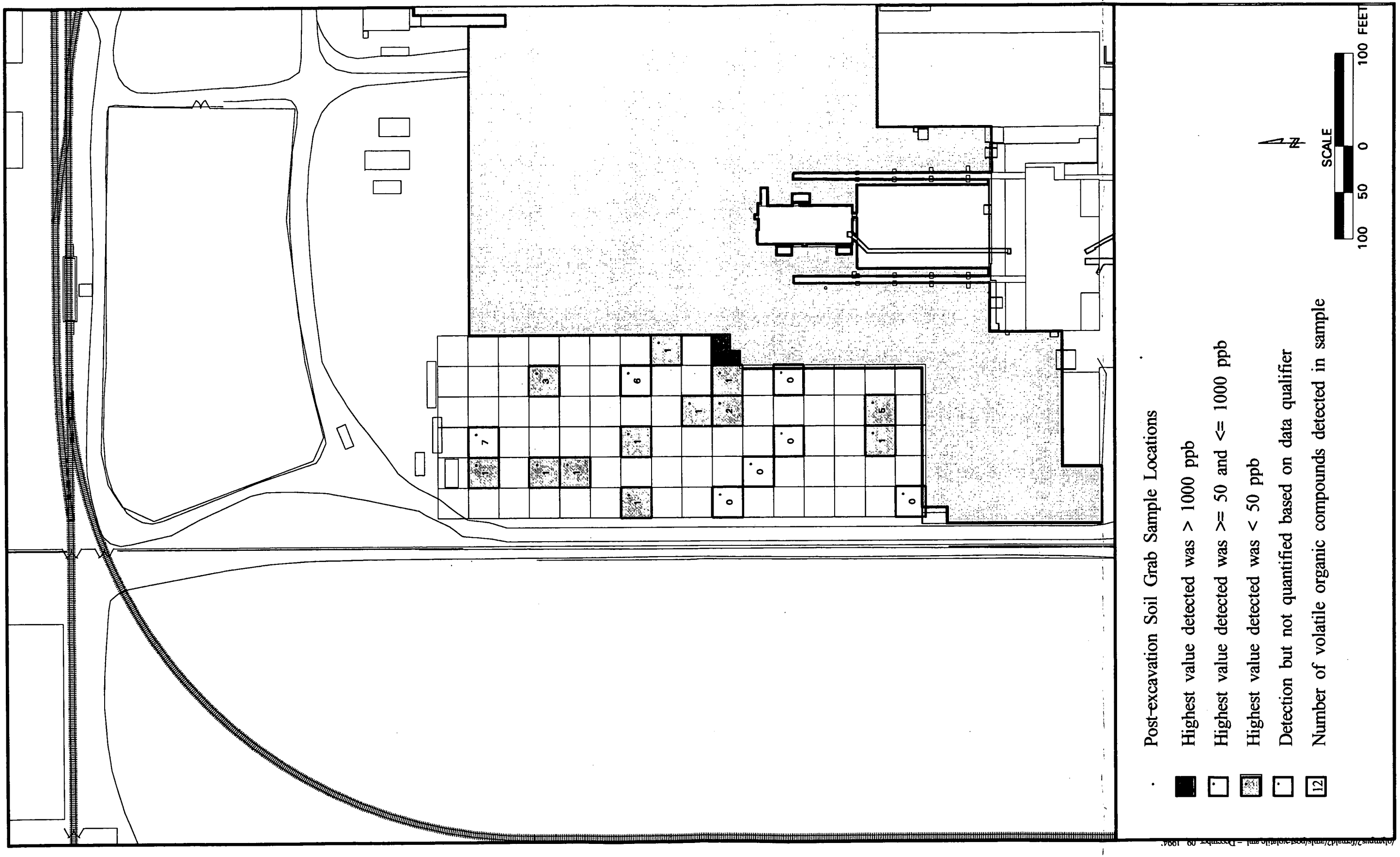

Figure 2-9. Distribution of VOC Detections in Post-excavation Grab Samples.

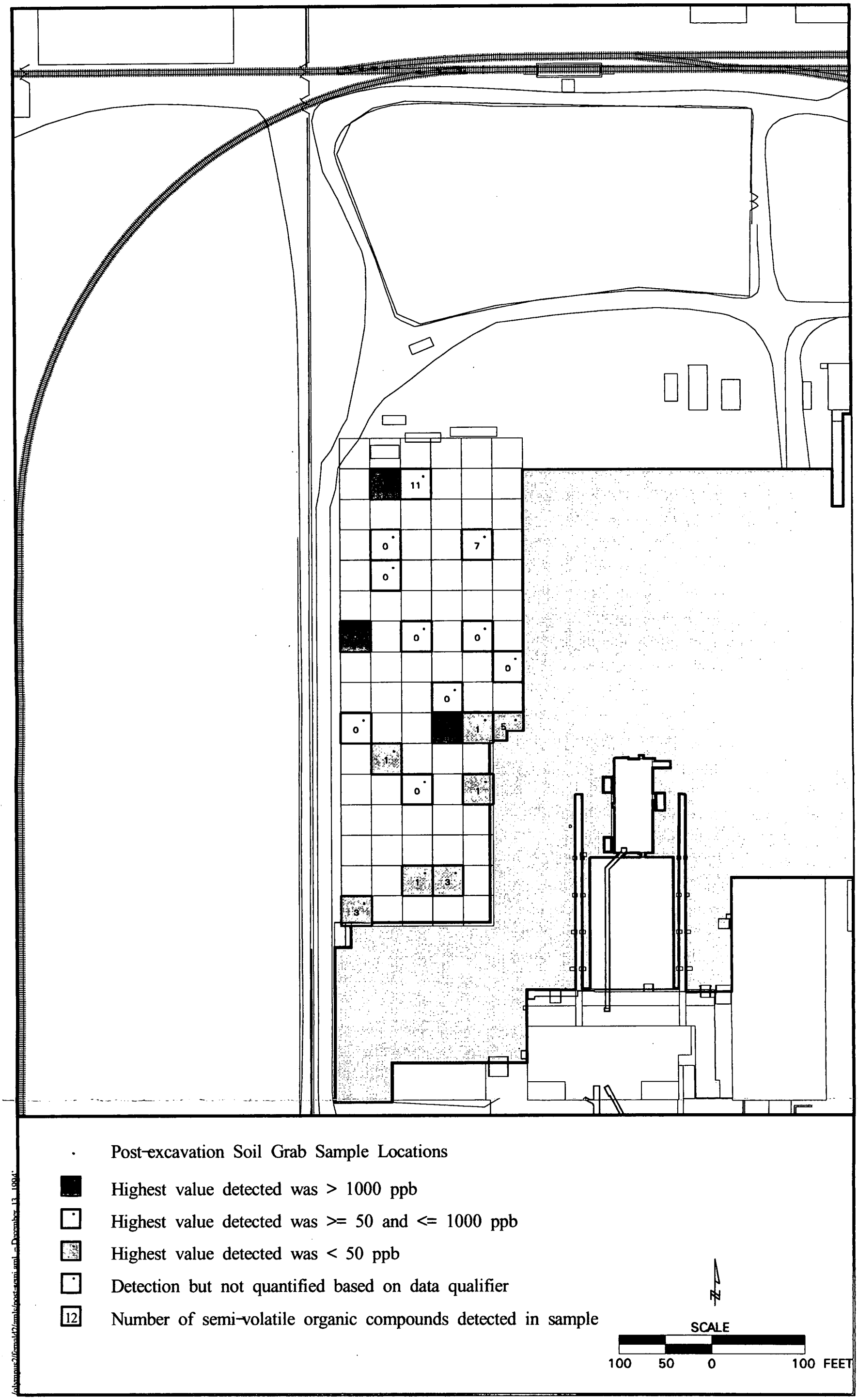

Figure 2-10. Distribution of SVOC Detections in Post-excavation Grab Samples.

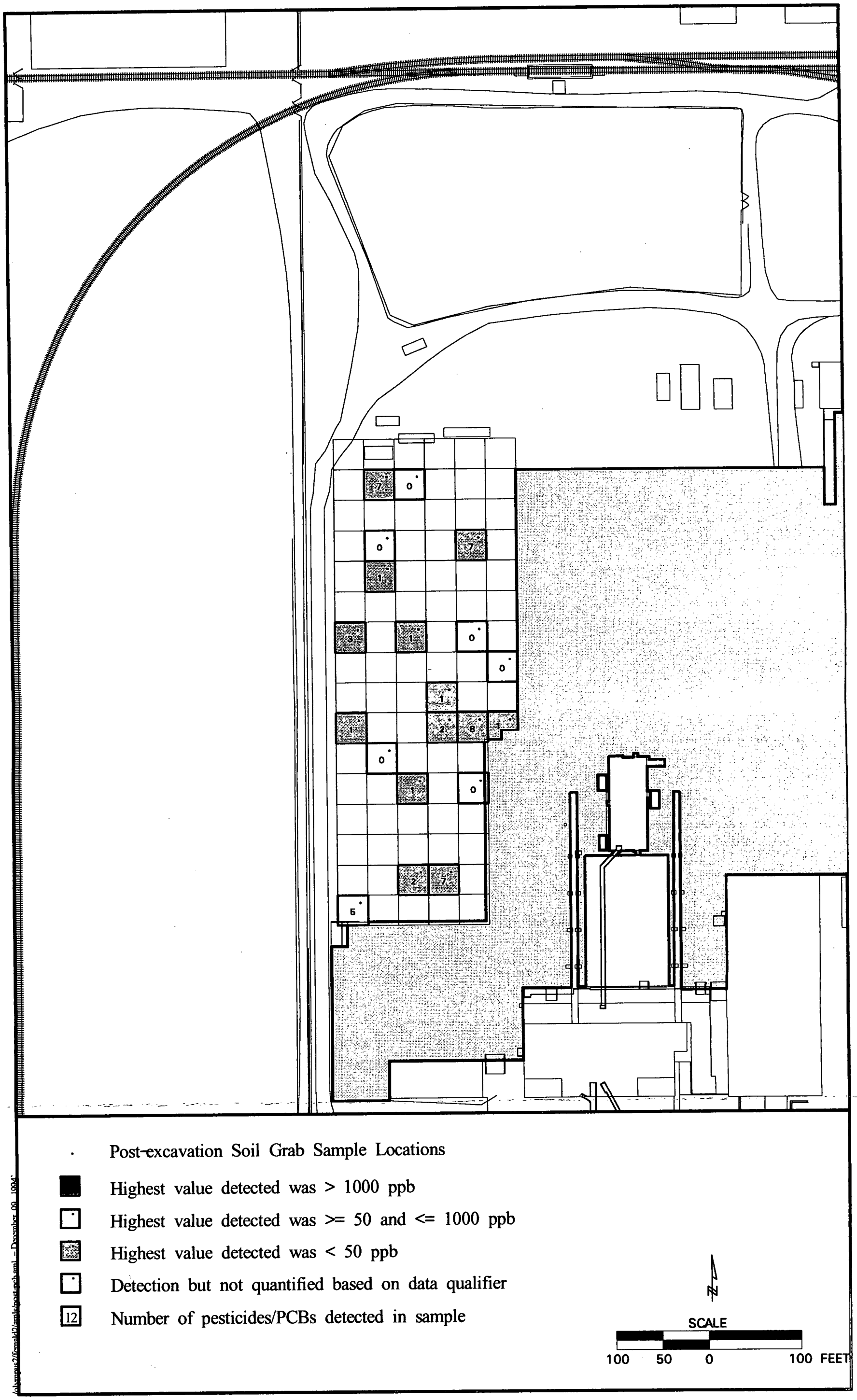

Figure 2-11. Distribution of Pesticide/PCB Detections in Post-excavation Grab Samples.

placed. A total of 2,345 cubic yards of concrete were placed. A view of Plant 1 Pad prior to Phase A/B construction is shown in Figure 2-12. Plant 1 Pad during Phase A soil removal is shown in Figure 2-13. Plant 1 Pad during Phase A/B pad construction is shown in Figure 2-14.

In October 1991, the RCRA permit application for the FEMP was revised. The revised application sought a storage permit for the Plant 1 Pad. The new structures constructed on the pad provide RCRA storage for hazardous and mixed wastes. In August 1992, upon the completion of new concrete placement, the construction of RCRA storage structures TS-4 and TS-5 began. These structures were placed side-by-side over the new pad area. Each structure provides approximately 40,000 square feet of covered, controlled RCRA storage. The structures were erected on curbs for containment and were internally subdivided into four discrete quadrants. Each quadrant was provided with a centrally located trench drain leading to a sump. The Plant 1 Pad drains and sumps are located only within the tension support structures, while there are catch basins located throughout the Plant 1 Storage Pad. The Plant 1 Pad drainage system has no connection to site drainage systems and serves only to collect liquids in the event of a leak or spill. The sumps are used to transport liquids to the General Sump, where they are treated and discharged to Manhole 175.

The trench drains and sumps, located in TS-4, TS-5, and TS-6, were sealed with a 86 mil chemically resistant epoxy coating. Similarly, the new concrete pad storage surface was sealed with six coats of chemically resistant polyurethane wear surface (86 mil dry thickness).

Phase A/B construction was completed on December 4, 1992. The Phase A/B area consisted of approximately 86,000 square feet of grassy area and 7,000 square feet of overlap on the existing pad's west edge. A view of Plant 1 Pad, at the completion of Phase A/B, is shown in Figure 2-15.

2.3.4 Waste Management

A RCRA determination was completed for the soil and concrete waste generated during Phase A/B construction. Based upon initial sampling conducted, Phase A/B soil and concrete was determined not to contain RCRA hazardous waste. However, this was based upon sample analysis using the Extraction Procedure Toxicity method which was

Figure 2-12. Stage I Construction–Plant 1 Pad West Edge Prior to Phase A/B Construction, Looking Southeast.

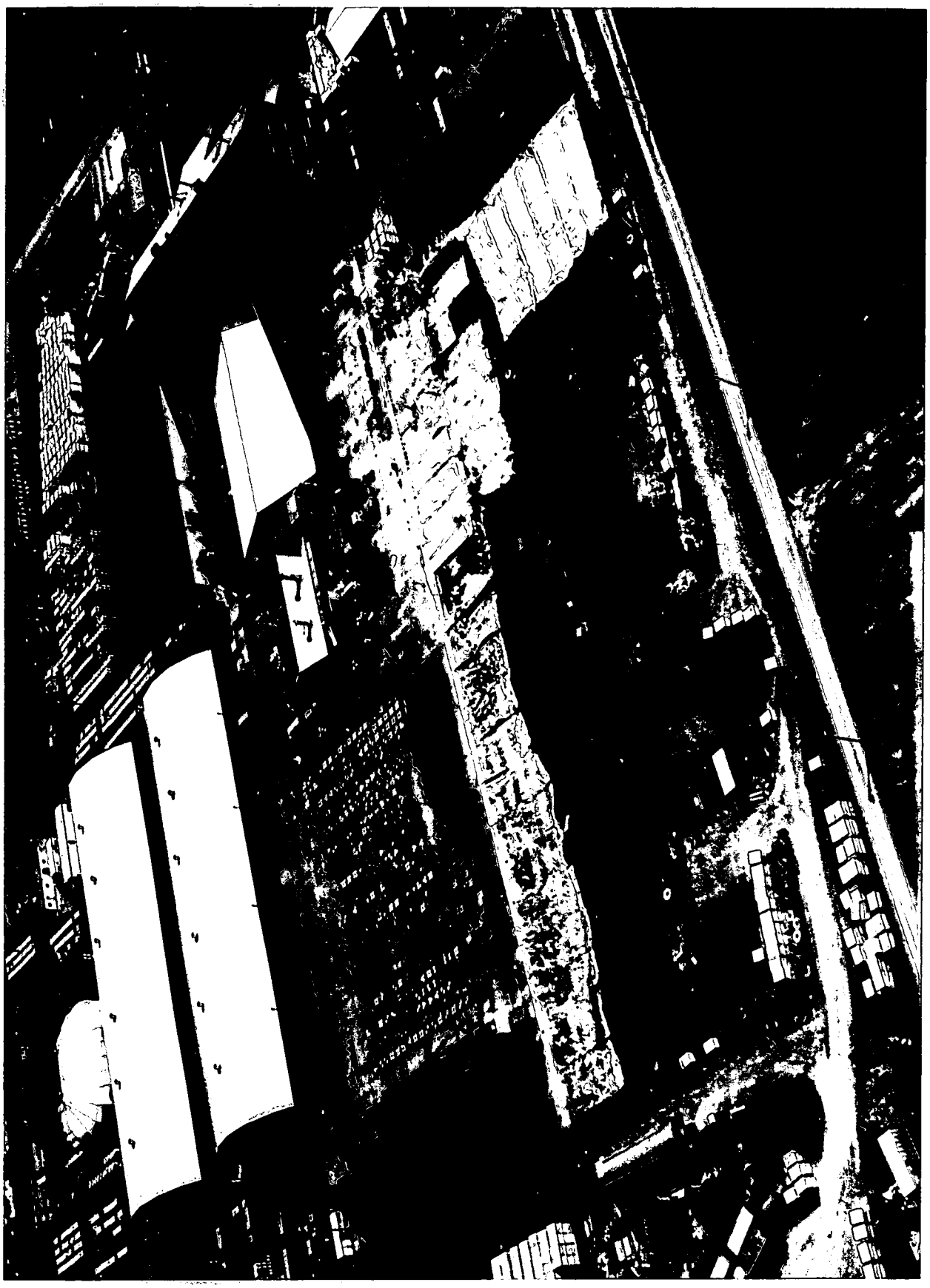

Figure 2-13. Phase A Soil Removal, Looking Southeast.

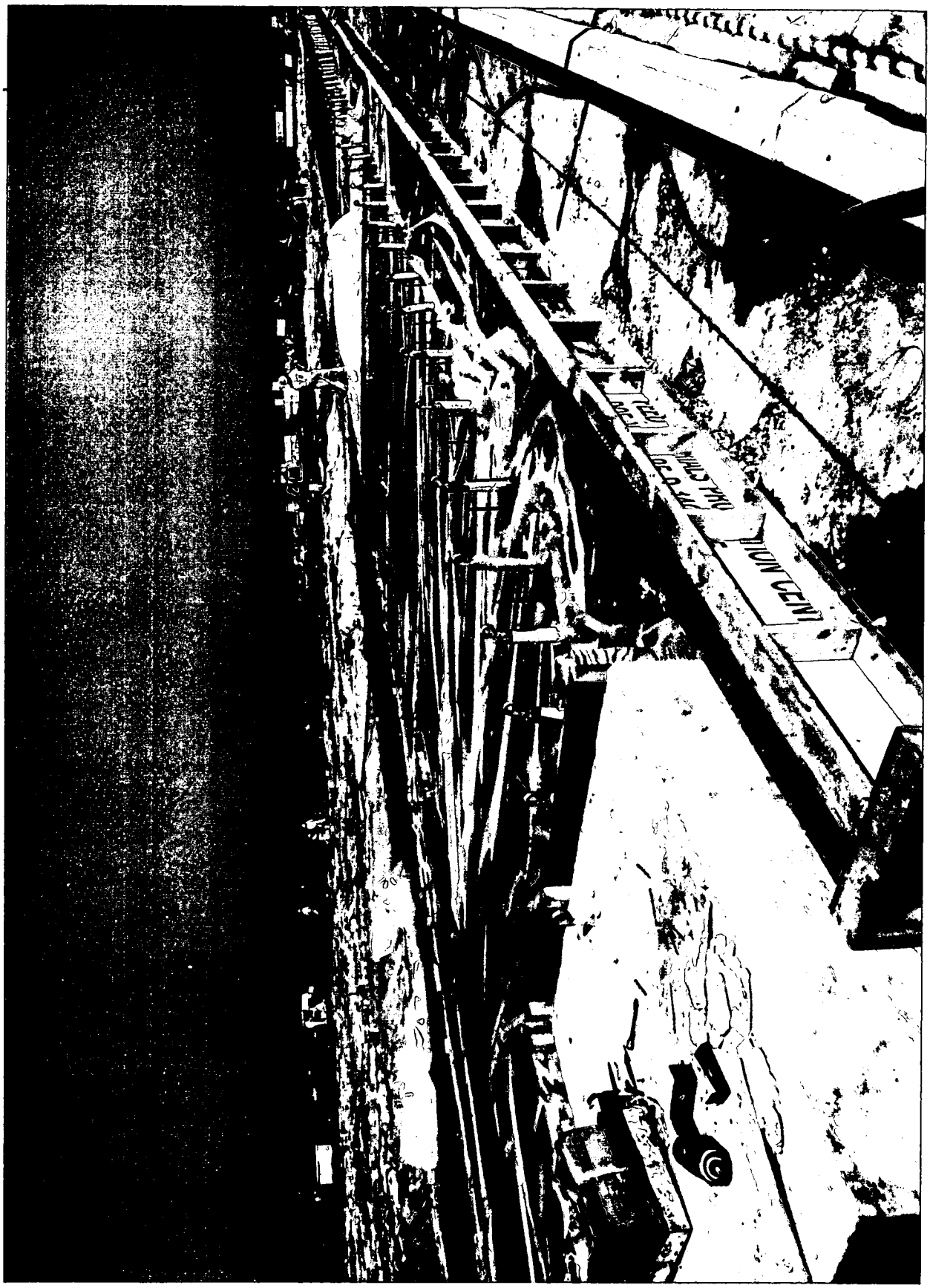

Figure 2-14. Phase A/B Pad Construction, Looking Northwest.

Figure 2-15. Plant 1 Pad at Completion of Phase A/B, Looking East.

replaced with the TCLP on September 25, 1990. Because of this, the soil in Phase A/B was re-sampled during the pre-construction sampling event in May 1991. As previously stated, the pre-construction samples were not analyzed for TCLP metals as required by the RAWP, because total metal concentrations detected in surface soil samples were too low to exceed TCLP regulatory levels. To meet the RAWP requirement, an addendum to the SAP was issued in October 1991 and 18 samples were subsequently collected for TCLP analysis (Attachment A, Table A-3). The results of the TCLP metals analysis were used to re-evaluate the RCRA determination. The subsequent RCRA determination, submitted on February 11, 1993, also found that soil and concrete waste generated during Phase A/B did not contain RCRA hazardous waste, and could be disposed of in accordance with site SOPs.

Waste generated during Phase A/B construction included: 18,000 cubic feet (ft^3) of contaminated soil, 500 ft^3 (75,000 pounds) of concrete rubble, 900 ft^3 (10,500 pounds) of metal (free release), 1,200 ft^3 (9,000 pounds) of wood, 1,200 ft^3 (10,000 pounds) of construction debris. The contaminated soil, concrete rubble, wood, and construction debris were sent to Nevada Test Site (NTS) for disposal.

2.4 STAGE III—PHASE C, D, AND E CONSTRUCTION

Section 2.4.1 provides a discussion of Phase C and D construction activities. Section 2.4.2 discusses Phase E construction activities, and Section 2.4.3 summarizes management and disposition of waste generated during Phases C, D, and E construction.

2.4.1 Phase C and D Construction

Preparations for Stage III work began in March 1993 with the removal of the scrap copper piles stored on the Phase D area of the Plant 1 Pad. Scrap copper removal was conducted under Removal Action No. 15 (FEMP 1992b). In July 1993, the construction contact for Phase C, D, and E work was awarded. Field work for Phases C, D, and E was accomplished in a progressive manner with Phase C completed first. Upon completion of each phase, drums were relocated from the next construction section to the completed section.

Field work for Stage III construction was initiated with the removal of 107 feet of the north end of TS-1. This section had to be removed to make room for the placement of

the RCRA storage structure TS-6 in Phase D. Removal of the north section of TS-1 was completed in August 1993.

Following the removal of the north end of TS-1, the first concrete placement for Phase C occurred on August 23, 1993. Prior to placing concrete for the new pad upgrade, the surface of the existing Plant 1 Pad was swept with a Tenant Sweeper equipped with High Efficiency Particulate Air (HEPA) filtration. Next, a polyethylene barrier covered with a layer of sand was placed between the existing pad and the new layer of concrete to prevent contamination of the new concrete.

Concrete placement for Phases C and D was completed in November 1993, at which time the erection of TS-6 began (Figure 2-16). TS-6, located in Phase D, provides 22,500 square feet of covered controlled storage. The new concrete surface in Phases C and D was sealed and coated with 86 mil polyurethane coating (Figure 2-17). Application of the coating was suspended, however, on December 10, 1993, due to cold temperatures. The coating application for Phases C and D was completed on June 1, 1994.

On June 8, 1994, during groundwater monitoring activities, groundwater monitoring technicians noted that the flush mounts of monitoring wells 1342, 1345, 1348, and 1361, located in the Phase C area, had been sealed over with a "rubber" sealant. It was ascertained that the 86 mil polyurethane coating used to coat Phase C had also covered the flush mount monitoring wells.

At a sampling event immediately following the removal of the polyurethane sealant from the flush mounts, groundwater monitoring technicians using a PID noted initial organic vapor readings of more than 100 ppm in wells 1342 and 1348. After 5 minutes, the organic vapor concentration decreased to approximately 4.1 ppm. During subsequent sampling of the wells on June 13, 1994, a solid reddish substance was observed. It was suspected to be the polyurethane coating material, and a report was filed with the Assistant Emergency Duty Officer (AEDO) on June 14, 1994.

The AEDO determined that an unknown quantity of the polyurethane sealant material had entered monitoring wells 1342, 1345, 1348, and 1361 during Phase C activities. The sealant material contained several VOCs (xylenes, toluene, isopropyl alcohol) and

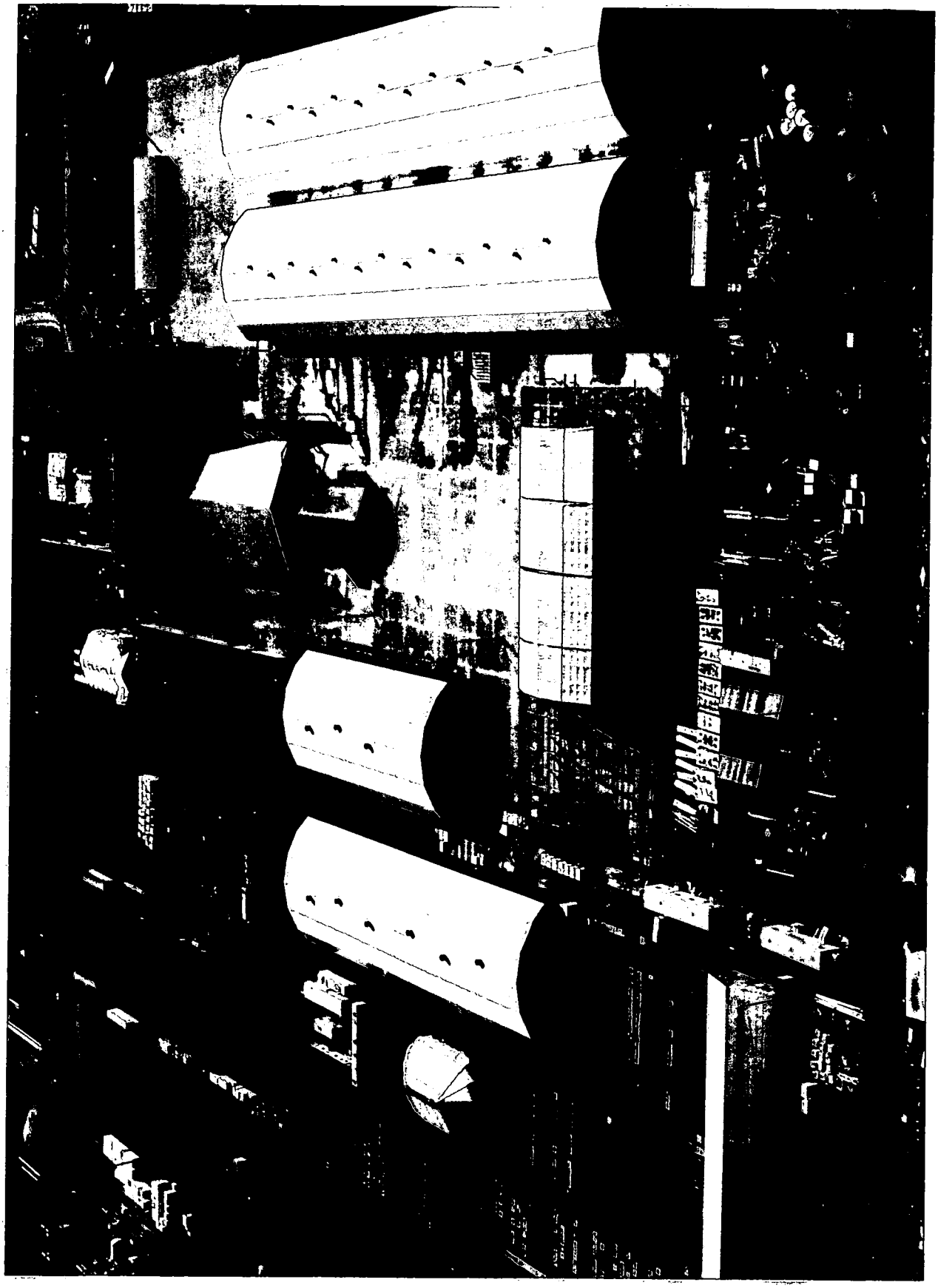

Figure 2-16. Plant 1 Pad During Construction of TS-6 (Phase D), Looking South.

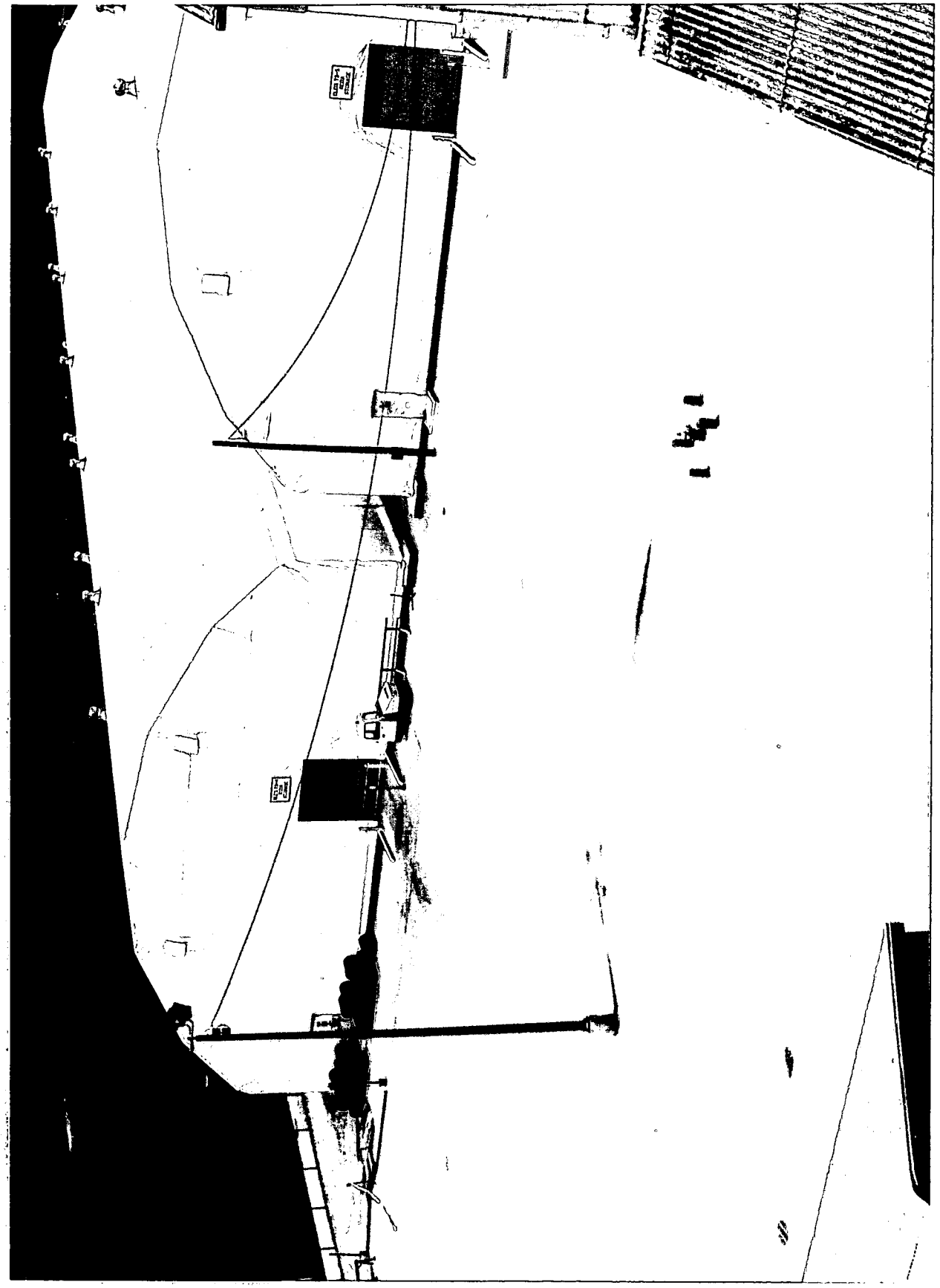

Figure 2-17. Completed Phase C Pad Construction with 86 mil Coating, Looking Northwest.

SVOCs. Groundwater monitoring data for these four wells, as well as other wells in the Plant 1 Pad vicinity are on file and available upon request.

Because of the potential chemical effects of the contaminants on the polyvinyl chloride (PVC) casing material of the wells, it was determined that the four monitoring wells should be grouted and abandoned. The well abandonment is planned after sample and analysis activities are performed. However, their abandonment does not affect completion the objectives of Removal Action No. 7. The USEPA and OEPA will be notified when abandonment of Wells 1342, 1345, 1348, and 1361 is completed.

After Removal Action No. 7 was completed on September 30, 1994, two low areas in the Plant 1 Pad surface were noted, northwest and northeast of TS-6 in the Phase D area. These low areas resulted in water ponding on the pad surface. The subcontractor installed a drain in each of the low areas. The drains connect with the Plant 1 Pad catch basins which transport rainwater to the General Sump.

2.4.2 Phase E Construction

Removal of the temporary tension support structures (TS-1, TS-2, and TS-3) began in June 1994 and was completed July 21, 1994, to allow completion of Phase E. Initially, Phase E was to be constructed in the same manner as Phases C and D. Because of refinements of the FEMP waste management plans, there was a need to expand the use of Phase E from the storage of containerized radioactive waste to also allow storage of surface decontaminated bulk material generated by the dismantling of buildings and structures. The bulk material to be stored on the Phase E are will be decontaminated in accordance with the Interim Record of Decision (IROD) for OU3 before storage.

Because of the decision to expand the use of Phase E, the coating design for sealing and coating the surface was re-evaluated to find a material sufficiently durable for the storage of bulk material. To maintain the project schedule, evaluation of coatings was completed prior to finishing the concrete work. Coatings considered for Phase E of the Plant 1 Pad were evaluated based on the following criteria:

1. imperviousness to chemicals and water resistance;
2. durability - the ability to withstand vehicle traffic and bulk load without losing coating integrity;

3. seam-barrier strength; and
4. ability to install coating during cool weather.

The evaluation identified Surtreat® as the preferred coating for the following reasons:

1. Other coatings reviewed were not resistant to chemicals;
2. Surtreat® had been successfully used on three other FEMP projects (Plant 9 Warehouse, Plant 6 Warehouse, and Plant 8 Southwest Annex);
3. Surtreat® specifies expansion joint material which enhances seam strength; and
4. Surtreat® can be applied at cooler temperatures than the other coatings evaluated.

It was determined during the coating evaluation that Surtreat® would provide protection from releases and permit heavy duty storage activities on the pad without destroying the integrity of the coating. Additionally, it was determined that safety would be enhanced by preventing tears in the coating which would create an uneven surface for the movement of equipment and containers.

The refinement to the intended usage of Phase E, and the use of Surtreat® coating rather than the 86 mil polyurethane coating that was used in all other phases of the removal action, constituted a change to the initial RAWP for Removal Action No. 7. USEPA was notified of this change and approved it on July 22, 1994. These changes in coating material provide more protection to human health and the environment by enhancing the integrity of seam strength and the durability of the pad coating. These changes also coincide with the objectives of Removal Action No. 7 by mitigating the continuing release of contaminants from the Plant 1 Pad until final remediation can be performed under OU5.

Concrete placement and Surtreat® coating application were conducted during September 1994, and was completed September 30, 1994, completing the objective of Removal Action No. 7 by mitigating the release of contaminants from the Plant 1 Pad until final remediation is conducted under OU5.

Upon completion of Phase E work for Removal Action No. 7, post-construction inspections revealed that the expansion joint material began to seperate from the concrete. This separation was noted in the Phase E area expansion joints only. Design criteria specified a joint material that will bond to the concrete to provide a moisture-resistant barrier and to protect the edges of the concrete. The expansion joint will be replaced with a material that will meet the requirements of the design specifications. However, the joint replacement does not affect completion of the objectives of Removal Action No. 7. The USEPA and OEPA will be notified once the repairs are completed.

2.4.3 Waste Management

Stage III work initially included the removal and disposal of contaminated soils and concrete for the purpose of installing catch basins within the pad surface. However, in December 1992, the OEPA and USEPA approved Removal Action No. 17, Improved Storage of Soil and Debris (FERMCO 1992), establishing guidelines for the management of contaminated soil and debris at the FEMP. Removal Action No. 17 resulted in numerous improvements in the management of soil and debris and since it has been approved, it is considered to be the applicable guidance for management of soils at the FEMP. In accordance with Removal Action No. 17, excess soil generated during Phases C, D, and E construction were segregated and managed as specified in Phase I of the Removal Action No. 17 Work Plan. Specifically, non-hazardous soil containing less than or equal to 100 pCi/g total uranium, 50 pCi/g total thorium, and 5 pCi/g total radium, was placed into a controlled stockpile. Non-hazardous soil that exhibited activities greater than those specified were placed into a controlled stockpile under tarpaulins. Soil containing hazardous waste was containerized and managed accordingly. However, the soil removed during Removal Action No. 7 did not contain hazardous waste.

Waste materials generated during Stage III construction included: 185 ft^3 of sweeping waste, 18,000 ft^3 of contaminated soil, 312,500 pounds of concrete rubble, 6,000 pounds of metal, 24,000 pounds of wood, 128 ft^3 of asbestos, and 500 pounds of miscellaneous plastic and paper, etc. These materials were containerized and staged on the Plant 1 Pad pending characterization. Low-level waste was shipped to the NTS. No materials were identified that caused the waste to meet any of the hazardous waste listings under OAC 3745-51-31 to -33 or exhibit any of the hazardous waste characteristics under OAC 3745-51-21 to -24.

2.5 ENVIRONMENTAL MONITORING

To ensure the continued protection of human health and the environment, a long-term environmental monitoring program has been implemented at the FEMP. For Removal Action No. 7, environmental monitoring was enhanced to focus more appropriately on the environmental conditions present at the Plant 1 Pad during the removal action. The environmental monitoring program near the Plant 1 Pad encompassed air sampling during Phase A/B construction and enhanced groundwater monitoring throughout the removal action.

2.5.1 Air Sampling

During Phase A/B construction, portable air samplers were placed at the perimeter of the open excavation and the soil stockpile to measure airborne particulate concentrations. Air samples were collected weekly and analyzed for gross alpha and gross beta concentrations at the Fernald site laboratory. There were no indications of elevated concentrations of contaminants.

2.5.2 Groundwater Monitoring

The existing FEMP groundwater monitoring program was enhanced to provide additional monitoring near the Plant 1 Pad during the course of the removal action to identify any changes in groundwater quality. Groundwater monitoring was performed in both the perched water and the regional aquifer underlying the Plant 1 Pad. All groundwater samples were collected in accordance with the RI/FS Quality Assurance Project Plan (QAPP) (FEMP 1992a). Groundwater data is on file and is available upon request. The interpretation for groundwater monitoring results at the FEMP site is presented in the FEMP Annual Environmental Report.

3.0 CONCLUSIONS

The objective of Removal Action No. 7 was to mitigate the continuing release of contaminants from the Plant 1 Pad until final remediation.

This objective was accomplished through 1) capping contaminated soil west of the pad with sealed concrete; and 2) upgrading the remaining pad with placement of sealed concrete in Phases C, D, and E.

Consistent with the NCP, Removal Action No. 7 contributed to the efficient performance of projected final remedial actions at the FEMP. The goals of the FEMP in conducting Removal Action No. 7 were to minimize the potential for releases of hazardous substances incidental to removal field operations, and to conduct the action in a cost efficient and safe manner consistent with site SOPs and worker health and safety requirements. These goals were achieved, and the removal action was completed on September 30, 1994.

4.0 REFERENCES

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ATTACHMENT A

ANALYTICAL DATA

Table A-1. Pre-excavation Soil Sample Analytical Results at 0- to 6-inch Interval.

Sample No.		61401	61408	61408	61415	61429	61422	61394	61373	61352	61359	61436	61387	61380	61443	61443	61366	61347	61458	61458	61450	61450	61465	61465
Sample Location		P1P45	P1P46	P1P46 (dil)	P1P47	P1P48	P1P49	P1P50	P1P51	P1P52	P1P53	P1P54	P1P55	P1P56	P1P57	P1P57 (dil)	P1P58	P1P59	P1P60	P1P60 (dil)	P1P61	P1P61 (dil)	P1P62	P1P62 (dil)
Analyte	**Upper 95% Confidence Level[1/]**																							
% Moisture		18	12	12	17	15	14	14	–	–	–	14	–	–	13	13	–	–	18	18	8	8	13	13
% Solids		81.6	88.2	–	82.6	85.4	85.5	86.2	–	–	–	85.5	–	–	87.4	–	–	–	82.3	–	92.1	–	87	–
Pesticide/PCBs (ppb)																								
Aroclor-1254		**170 J**	**960 F**	**930 DJ**	**140 J**	**33 J**	**16 J**	**130 J**	**11 J**	**15 J**	**150 J**	**10 J**	**18 J**	**50 J**	**700 F**	**650 DJ**	**19 J**	**29 J**	**460 F**	**450 DJ**	**740 F**	**1,100 DJ**	**1,500 F**	**1,400 DJ**
Inorganics (ppm)																								
Aluminum	13,724/20,098	16,500	8,640	–	11,700	12,600	12,400	7,070	15,300	11,400	8,580	13,100	11,700	9,090	12,300	–	9,550	9,390	9,620	–	12,800	–	7,960	–
Antimony	7.7/6.7	**31.2**	**29.1**	–	**27.4**	**29.3**	**28.1**	**29.2**	**29.4**	**23.2**	**24.2**	**27.3**	**21.2**	**22.2**	**33.1**	–	**28.3**	**29.5**	**30.8**	–	**35.2**	–	**33**	–
Arsenic	10.20/12.52	8.1	6.1	–	8.1	10.8	8.1	4.2	8.5	7.8	5	7.2	7.9	5.3	6.6	–	5.1	4.6	4.7	–	5.3	–	6.7	–
Barium	161.64/140.89	146	80.7	–	102	**1,570**	103	69.4	11.4	92.7	89	110	107	67.6	91.4	–	73	70	73.2	–	84.1	–	58.3	–
Beryllium	0.6/0.89	1 B	0.84 B	–	0.98 B	1 B	0.97 B	1.1 B	1.2	0.99 B	0.86 B	0.98 B	1 B	0.82 B	0.98 B	–	0.97 B	1 B	0.9 B	–	1.1	–	0.87 B	–
Cadmium	0.82/0.59	**4.5**	**5.3**	–	**4.1**	**4.8**	**4**	**5.7**	**4.5**	**3.5**	**3.6**	**3.6**	**2.9**	**3.3**	**5.5**	–	**5**	**4.7**	**5**	–	**5.8**	–	**5.9**	–
Calcium	5,7911/335,000	24,100	62,100	–	43,700	29,500	38,200	10,600	38,200	23,800	36,100	27,900	17,000	35,100	58,500	–	78,700	128,000	84,900	–	73,600	–	106,000	–
Chromium	17.8/25.4	**26.2**	22.6	–	21.7	**25.6**	22	14.7	**26.1**	19	17.5	22.8	18.8	16.2	24.9	–	17	12.4	19.4	–	22.9	–	16.9	–
Cobalt	17.76/20.96	17	**24.7**	–	13.9	**44.9**	13.2	10 B	16.1	13.9	10.9 B	12.1	12 B	11.1 B	16.9	–	12.1	11.2	11.2 B	–	13	–	12.7	–
Copper	16.43/18.55	**32.2**	**28.1**	–	**24.8**	**859**	**23.5**	**23.3**	**45.5**	**23.4**	**20.6**	**40.1**	**21.6**	**18.6**	**34.1**	–	**21.5**	0.39	**24.4**	–	**30**	–	**26.9**	–
Cyanide	0.34/0.11	–	–	–	–	0.16 B	0.17 B	**1**	–	0.21 B	0.17 B	–	0.2 B	–	–	–	–	**20.3**	–	–	–	–	–	–
Iron	25,979/35,315	30,300	24,400	–	25,700	27,200	24,500	14,000	30,800	27,800	19,500	23,200	24,800	18,800	23,000	–	19,300	18,800	16,800	–	22,900	–	18,100	–
Lead	29.56/17.71	16.5	**44**	–	26.9	**73.5**	23	**68.2**	15.5	**41**	**70.7**	20.8	23.5	**30**	**30.5**	–	16.5	14.6	28.8	–	**37.1**	–	**60.5**	–
Magnesium	3,334/51,599	11,700	18,700	–	12,200	12,700	11,100	27,700	12,900	8,930	11,600	8,580	7,280	10,400	19,200	–	20,900	18,400	17,600	–	21,500	–	23,500	–
Manganese	2,516/1,279	621	504	–	603	542	593	668	661	631	617	448	521	580	711	–	609	500	480	–	544	–	498	–
Mercury	0.3/0.29	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.2	–	0.16	–
Molybdenum	2.6/2.7	**3.5**	**4.2**	–	**3.2**	**3.8**	**3.4**	**3.7**	**3.4**	**2.9**	2.5	**2.9**	**2.8**	2.5	**4**	–	**3.6**	**3.4**	**4.1**	–	**4.4**	–	**4.4**	–
Nickel	27.33/35.97	34.7	**49.1**	–	31	**57**	26.9	25.3	35.9	30.4	26.7	29.8	27.3	23.3	32	–	26.5	27.3	26.5	–	35.9	–	32.2	–
Potassium	1,402/2,946	1,400	889	–	1,020 B	2,300	1,100 B	759 B	1,570	1,150 B	717 B	1,060 B	1,260	1,090 B	1,540	–	1,320	1,110	1,450	–	1,980	–	1,390	–
Selenium	0.72/0.61	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Silver	2.6/2.2	**6.7**	**9.5**	–	**8.3**	**7.9**	**7.6**	**7.4**	**8.3**	**5.4**	**7.4**	**7.2**	**4.6**	**6.3**	**10**	–	**8**	**5.8**	**9.9**	–	**9.2**	–	**9.3**	–
Sodium	56.96/258.94	244 B	96.8 B	–	80.6 B	259 B	73.8 B	120 B	150 B	62.6 B	72.1 B	82.6 B	56.5 B	78.4 B	107 B	–	112 B	136 B	144 B	–	160 B	–	158 B	–
Thallium	0.58/0.43	–	–	–	–	0.72 B	0.57 B	0.52 B	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Vanadium	35.3/49.63	35.8	26	–	29.5	31.6	32.8	19.4	35.3	30.5	25.1	28.7	28.9	24.7	32.4	–	25	22.7	24.2	–	30.4	–	21.4	–
Zinc	68.54/66.84	67.3	**180**	–	**86.3**	**159**	54.7	53.7	**70**	61.5	51	66.9	57.9	50.2	**74.7**	–	46.3	41.4	51.2	–	57.1	–	40.2	–

Note: This table lists only those pesticide/PCBs detected. Dashes (–) indicate no detection.

1/ The first set of Upper 95% Confidence Level (UCL) values shown are for the 0- to 6-inch interval; the second set of UCL values are for the 48- to 54-inch interval, indicating soils west of the Plant 1 Pad may have been disturbed during past construction activities. Values in bold indicate unqualified detections above the greater UCL value.

Laboratory Data Qualifiers:

B = Analyte found in associated blank.

F = Indicates value is estimated due to a confirmed compound which is off the scale in both columns.

D = Identifies compounds analyzed at a secondary dilution factor.

J = The analyte concentration was detected at a level greater than the minimum detectable concentration, but deficiencies in data quality make the detection estimated.

Table A-2. Pre-excavation Soil Sample Analytical Results at 18- to 24-inch Interval.

Sample No.	61406	61413	61420	61434	61427	61399	61378	61357	61364	61441	61392	61385	61448	61371	61463	61455	61455R	61470
Sample Location	P1P45	P1P46	P1P47	P1P48	P1P49	P1P50	P1P51	P1P52	P1P53	P1P54	P1P55	P1P56	P1P57	P1P58	P1P60	P1P61	P1P61	P1P62
Analyte																		
% Moisture	16	11	17	16	18	–	–	–	–	11	–	–	13	–	23	8	–	10
Volatile Organics (µg/kg)																		
Acetone	12 B	9 BJ	5 BJ	9 BJ	–	19 B	12 B	7 BJ	33 B	9 BJ	10 BJ	10 BJ	6 BJ	28 B	–	–	6 BJ	3 BJ
Methylene chloride	23 B	16 B	13 B	19 B	19 B	5 BJ	5 BJ	5 BJ	4 BJ	22 B	10 B	4 BJ	35 B	4 BJ	38 B	16 B	4 BJ	17 B
2-Butanone	3 BJ	–	4 BJ	–	–	4 BJ	–	–	10 BJ	6 BJ	–	–	5 BJ	4 BJ	9 BJ	6 BJ	–	–
2-Hexanone	–	–	–	–	–	2 BJ	–	–	2 BJ	–	–	–	–	3 BJ	–	–	–	–
Semivolatile Organics (µg/kg)																		
Benzo(a)pyrene	–	–	–	–	–	–	–	–	–	–	–	–	**190 J**	–	–	**620**	–	**240 J**
Dibenzo(a,h)anthracene	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	**100 J**	–	–
Benzo(a)anthracene	–	–	–	–	–	–	–	–	–	–	–	–	**280 J**	–	–	**740**	–	**280 J**
4-Chloro-3-methylphenol	–	–	–	–	–	–	**45 J**	–	–	–	–	–	–	–	–	–	–	–
Acepaphthene	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	**77 J**	–	–
Diethyl phthalate	–	**64 J**	–	–	–	–	–	–	–	–	–	–	–	–	**74 J**	–	–	–
Di-n-butyl phthalate	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	**190 J**
Phenanthrene	–	–	–	–	–	–	–	–	–	–	–	–	**83 J**	–	–	**870**	–	**370 J**
Fluorene	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	**77 J**	–	–
Naphthalene	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	**54 J**	–	–
2-Methylnaphthalene	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	**45 J**	–	–
2-Chlorophenol	–	–	–	–	–	–	**42 J**	–	–	–	–	–	–	–	–	–	–	–
Phenol	–	–	–	–	–	–	**51 J**	–	–	–	–	–	–	–	–	**38 J**	–	**41 J**
bis(2-Ethylhexyl)Phthalate	–	–	–	–	–	–	**200 J**	–	–	**100 J**	–	–	–	–	–	**170 J**	–	**130 J**
Di-n-Octyl Phthalate	–	–	–	–	–	–	**58 J**	–	–	–	–	–	–	–	–	–	–	–
Anthracene	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	**190 J**	–	**66 J**
Pyrene	–	–	**46 J**	–	–	–	**50 J**	–	–	–	–	**43 J**	**360 J**	–	–	**1,300**	–	**570**
Dibenzofuran	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	**67 J**	–	–
Benzo(g,h,i)perylene	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	**500**	–	**230 J**
Indeno(1,2,3-cd)pyrene	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	**410**	–	**170 J**
Benzo(b)fluoranthene	–	–	–	–	–	–	–	–	–	–	–	–	**510**	–	–	**1,400**	–	**590**
Fluoranthene	–	–	–	–	–	–	–	–	–	–	–	–	**300 J**	–	–	**1,300**	–	**600**
Chrysene	**400**	**370**	**400**	**400**	**410**	–	–	–	–	**370**	–	–	**330**	–	**440**	–	–	**380**

Note: This table indicates only those analytes detected. Unqualified detections are shown in bold. Dashes (–) indicate no detection.
Laboratory Data Qualifiers:
B = Analyte found in associated blank.
J = The analyte concentration was detected at a level greater than the minimum detectable concentration, but deficiencies in data quality make the detection estimated.

Table A-3. TCLP Samples Collected from West Side of Plant 1 Pad—December 1991.

Sample No.	Arsenic (μg/L)	Barium (μg/L)	Cadmium (μg/L)	Chromium (μg/L)	Lead (μg/L)	Mercury (mg/kg)	Selenium (μg/L)	Silver (μg/L)
61525	--	**1,110**	1.1 B	--	--	0.03 B	--	**50.9**
61526	--	**9,050**	--	3.1 B	--	--	--	--
61527	--	**9,440**	--	--	--	--	--	--
61528	--	**13,800**	3.3 B	--	**22.4**	--	--	--
61529	--	**9,170**	--	--	--	--	**35.7**	--
61530	--	**9,290**	--	--	--	--	--	**22.8**
61531	--	**9,460**	--	--	**30.1**	--	--	8.4 B
61532	--	**10,400**	--	--	--	0.02 B	--	--
61533	--	**9,640**	--	--	--	0.03 B	--	--
61534	--	**10,600**	--	--	--	0.03 B	--	--
61535	--	**9,930**	--	2.1 B	--	0.02 B	--	--
61536	--	**9,520**	--	--	--	--	--	--
61537	**13.6**	**9,610**	--	--	--	--	--	--
61538	**37.2**	**9,530**	--	--	--	--	**32.7**	--
61539	--	**9,830**	--	--	--	--	--	--
61540	--	**9,520**	--	--	--	0.05 B	--	**44.2**
61541	--	**9,660**	--	--	--	**0.11**	--	**11.6**
61542	--	**9,090**	--	--	--	0.05 B	--	--
Regulatory Level	5,000	100,000	1,000	5,000	5,000	200	1,000	5,000

Note: This table indicates only those analytes detected. Positive detections are shown in bold. Dashes (--) indicate no detection.
Laboratory Data Qualifiers:
B = Analyte found in associated blank.

Table A-4. Post-excavation Soil Sample Analytical Results for Total Thorium and Total Uranium Analyses (ppm). Page 1 of 2

Sample Number	Sample Location	Total Th	Total U	Sample Number	Sample Location	Total Th	Total U	Sample Number	Sample Location	Total Th	Total U
40437	Grid 7	--	--	40341	Grid 25	--	--	40248	Grid 44	--	--
40442	Grid 8	--	--	40346	Grid 26	--	--	40253	Grid 45	--	--
40449	Grid 9	--	--	40353	Grid 27	--	--	40258	Grid 46	--	--
40456	Grid 10	--	--	40358	Grid 28	--	--	40263	Grid 47	--	30
40461	Grid 11	--	--	40363	Grid 29	--	25	40268	Grid 48	--	33
40466	Grid 12	--	74	40368	Grid 30	--	41	40211	Grid 49	--	--
40529	Grid 12[1/]	--	11	40311	Grid 31	--	--	40216	Grid 50	--	--
40407	Grid 13	--	--	40316	Grid 32	--	--	40221	Grid 51	--	--
40412	Grid 14	--	14	40321	Grid 33	--	21	40226	Grid 52	--	12
40417	Grid 15	--	--	40326	Grid 34	--	13	40233	Grid 53	--	48
40422	Grid 16	--	--	40331	Grid 35	--	33	40238	Grid 54	--	21
40427	Grid 17	--	28	40336	Grid 36	--	24	40174	Grid 55	--	--
40432	Grid 18	--	46	40275	Grid 37	--	--	40181	Grid 56	20	--
40373	Grid 19	--	--	40282	Grid 38	--	--	40186	Grid 57	--	--
40378	Grid 20	--	--	40287	Grid 39	--	--	40191	Grid 58	18	30
40385	Grid 21	--	--	40294	Grid 40	--	12	40198	Grid 59	--	70
40390	Grid 22	--	--	40299	Grid 41	--	13	40524	Grid 59[1/]	--	34
40395	Grid 23	--	45	40306	Grid 42	--	24	40204	Grid 60	--	19
40402	Grid 24	--	40	40243	Grid 43	--	--	40147	Grid 61	--	--

Table A-4. Post-excavation Soil Sample Analytical Results for Total Thorium and Total Uranium Analyses (ppm). Page 2 of 2

Sample Number	Sample Location	Total Th	Total U	Sample Number	Sample Location	Total Th	Total U	Sample Number	Sample Location	Total Th	Total U
40152	Grid 62	--	--	40098	Grid 72	18	19	40044	Grid 82	18	40
40159	Grid 63	--	--	40103	Grid 73	--	17	40049	Grid 83	18	63
40164	Grid 64	--	35	40108	Grid 74	20	19	40514	Grid 83[1/]	19	30
40169	Grid 65	--	27	40113	Grid 75	--	20	40056	Grid 84	19	53
40118	Grid 66	--	--	40068	Grid 76	--	59	40509	Grid 84[1/]	18	--
40123	Grid 67	--	--	40519	Grid 76[1/]	--	--	40063	Grid 85	--	13
40128	Grid 68	--	--	40073	Grid 77	--	--	40012	Grid 86	--	36
40135	Grid 69	--	17	40078	Grid 78	--	18	40019	Grid 87	--	39
40140	Grid 70	19	32	40083	Grid 79	18	23	40024	Grid 88	18	16
40093	Grid 71	--	--	40088	Grid 80	--	22	40029	Grid 89	19	17
				40088	Grid 81	--	31	40034	Grid 90	18	13

Note: This table indicates only those values above detection limits. Dashes (--) indicate no detection.
1/ Grids 12, 59, 76, 83, and 84 were re-excavated and resampled after the initial sample results exceeded the 35 pCi/g Total U Build-over Criteria.

Table A-5. Post-excavation Composite Samples for HSL Metals and Full Radiological Analyses.

Analyte	Sample No. / Sample Location	Upper 95% Confidence Level[1/]	40444 Grid 8	40451 Grid 9	40380 Grid 20	40397 Grid 23	40348 Grid 26	40277 Grid 37	40289 Grid 39	40301 Grid 41	40270 Grid 48	40228 Grid 52	40176 Grid 55	40192 Grid 58	40200 Grid 59	40206 Grid 60	40153 Grid 62	40130 Grid 68	40142 Grid 70	40051 Grid 83	40058 Grid 84	40014 Grid 86
Inorganics (ppm)																						
Aluminum		13,724/20,098	7,170 E	10,200 E	8,830 E	12,400 E	8,060 E	14,900 *	15,800 *	14,300 *	17,000 *	13,700 *	14,200 *	17,200 *	14,800 *	13,900 *	**20,700**	13,500	19,200	13,000	12,400	12,000
Antimony		7.7/6.7	41.7 N	22.2 N	37.1 N	33.3 N	33.7 N	13.8 UN*	19.5 N*	14.4 N*	22.4 N*	13.6 N*	23.4 N*	14 UN*	12.5 N*	14.4 N*	18.8 N	33.6 N	26.3 N	18.1 N	13.6 N	59.8 N
Arsenic		10.20/12.52	7.9 NS	6.2 NS	5.3 NS	6.4 NS	4.9 NS	7.9 N*	4.6 N*	8.7 N*	8.5 N*	9.2 N*	6.8 N*	7.9 N*	2.3 BN *+	3 BNS*	10.7 NS	6.6 NS	10.9 NS	6.7 N	8.2 NS	11.9 NS
Barium		161.64/140.89	67.4 E	91.8 E	59.9 E	95.5 E	52.2 E	105	102	81.1	142	92.2	101	114	119	75.1	174 *	94.8 *	107 **	99.3 *	101 *	96 *
Beryllium		0.6/0.89	–	0.97 B	0.42 B	0.65 B	0.24 B	–	–	0.4 B	0.67 B	0.52 B	0.40 B	0.83 B	0.48 B	0.41 B	0.81 B	–	0.41 B*	0.75 B	0.28 B	–
Cadmium		0.82/0.59	–	4.2	–	1.2 E	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Calcium		5,791/335,000	170,000 E	62,800 E	114,000 E	83,500 E	135,000 E	71,400	61,000	65,900	48,100	66,000	80,400	45,500	49,800	157,000	5,620	71,400	125,000 *	49,400	7,550	**347,000**
Chromium		17.8/25.4	9.4	11.7	12.5	17.6	11.9	18.5 *	17 *	15.3 *	17.9 *	16 *	21.1 *	23.8 *	18.7 *	19.7 *	25.3 *	11.2 *	21.7 **	21.5 *	15.9 *	17.8 *
Cobalt		17.76/20.96	6.3 B	9.1 B	7.8 B	9.3 B	7.7 B	10.5 B	8.5 B	8.9 B	12.7	10.2 B*	11.1 B	10.8 B	9.1 B	9.5 B	13.10 B	11.9 B	14.2 B*	8.6 B	9.9 B	9.2 B
Copper		16.43/18.55	19.3 N*	30 N*	24.4 N*	32.7 N*	51.6 N*	18.2	18	16.2	17.4	**18.9**	**22.2**	**33**	**18.9**	18	**19.2**	17.3	25.8 *	**22.5**	**20.2**	**20.6**
Iron		25,979/35,315	14,200 E	17,600 E	19,100 E	23,200 E	17,100 E	25,100	25,200	22,100	25,500	22,900	25,100	29,300	24,400	23,500	34,900	24,200	35,000 *	24,400	26,100	25,800
Lead		29.56/17.71	12.3 N*	13.2 N*	10.5 N*	11.7 NS*	8.2 NS*	13.4 N*	8 N*	19.4 N*	11 N*	9.8 N*	13.8 N*	16 N*	15.3 N*	8 N*	17.9 *	9.4 *	13.8 S**	11.3 *	8.7 *	17.4 *
Magnesium		3,334/51,599	19,400 E	19,300 E	22,500 E	18,000 E	33,500 E	17,600 *	14,700 *	16,400 *	13,400 *	16,500 *	18,100 *	18,500 *	16,100 *	16,200 *	3,880	10,300	29,100	12,600	4,700	39,500
Manganese		2,516/1,279	868 E	853 E	494 E	497 E	449 E	635 *	569 *	485 *	863 *	642 *	675 *	599 *	584 *	1,000 *	584 N*	624 N*	917 N*	663 N*	674 N*	898 N*
Molybdenum		2.6/2.7	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.6 BN	0.99 BN	1.1 BN*	0.84 BN	0.71 BN	2.5 NN
Nickel		27.33/35.97	12.5	15.1	13.1	14.8	13.7	20.7 *	22.9 *	22.8 *	22.1 *	25.5 *	25.8 *	25.1 *	22.6 *	22.1 *	30.4	28.7	32.4 *	29.9	29.8	26.4 N
Potassium		1,402/2,946	1,180	1,600	1,310	1,500	1,870	2,280	2,240	2,060	2,270	1,970	1,770	1,840	1,390	2,460	945 B	1,280 B	2,570 *	1,300	756 BB	1,860 BN
Selenium		0.72/0.61	1.1 UNW	1.1 UNW	1.1 UNW	1.2 UNW	1.1 UNW	1.10 UNW	1.10 UNW	0.12 UNW	1.2 UNW	1.1 UNW	1.2 UNW	0.12 UNW	1 UNW	1.2 UNW	0.25 BNW	2.10 BNW	3.7 BNW	1.4 BNW	1.8 BNW	2.7 BNW
Silicon		1,984/2,252	1,540	2,140	**2,360**	**2,830**	2,250	**6,090**	**5,960**	**6,660**	**5,880**	**6,470**	**6,110**	**6,510**	**5,440**	**5,400**	466 E*	2,370 E*	4,330 E*	3,320 E*	155 E*	4,140 EW*
Silver		2.6/2.2	–	0.97 B	–	1.3 B	–	–	–	1.10 B	–	–	–	1.4 B	1.7 B	–	–	–	–	–	–	–
Sodium		56.96/258.94	234 BE	121 BE	155 BE	151 BE	197 BE	133 B	117 B	144 B	126 B	119 B	138 B	144 B	150 B	209 B	99 B	106 B	275 B	106 B	80.6 B	294 B
Thallium		0.58/0.43	0.12 BNW	0.15 BNW	0.11 BNW	0.15 BNW	0.11 UNW	0.18 B	0.22 B	0.28 B	0.24 B	0.22 B	0.23 B	0.32 B	0.25 B	0.12 B	0.41 B	0.25 B	0.38 B	0.21 B	0.29 B	0.33 BW
Vanadium		35.3/49.63	14.9	20.2	17.6	25.5	16.6	28.2	30.3	26.1	31.8	26.8	29.5	33.1	31.1	29	33.6	24.7	33.9	26.3	18.8	25.5
Zinc		68.54/66.84	44.6	64.4	46.8	59.6	47	58.9	58.1	58.2	58	53.5	55.1	66.2	61.7	47	**76.2**	57.2	**86.1**	**75.4**	65.8	**218**

Notes: This table indicates only those analytes detected. Dashes (–) indicate no detection.

1/ The first set of Upper 95% Confidence Level values shown are for the 0- to 6-inch interval; the second set of UCL values are for the 48- to 54- inch interval, indicating soils west of the Plant 1 Pad may have been disturbed during past construction activities. Values in bold indicate unqualified detections above the greater UCL value.

2/ This grid was subsequently excavated, resampled, and found to contain levels of total uranium less than 35 pCi/g.

Laboratory Data Qualifiers:

B = Analyte found in associated blank.
N = Presumptive evidence exists for the presence of the analyte by the concentration cannot be quantified due to deficiencies in data quality.
S = The reported value was determined by the Method of Standard Additions.
* = Duplicate analysis was not within control limits.
E = The value is estimated due to interference.
W = Method of detection is Target Analyte List (TAL) metal analysis by furnace (U.S. Environmental Protection Agency [USEPA] Contract Laboratory Program [CLP] Protocol).
U = The analyte concentration was less than the minimum detectable concentration reported for the method.
+ = Correlation coefficient for the Method of Standard Additions is less than 0.995.

Table A-5. Post-excavation Composite Samples for HSL Metals and Full Radiological Analyses.

Analyte	Sample No. / Sample Location	40444 Grid 8	40451 Grid 9	40380 Grid 20	40397 Grid 23	40348 Grid 26	40277 Grid 37	40289 Grid 39	40301 Grid 41	40270 Grid 48	40228 Grid 52	40176 Grid 55	40192 Grid 58	40200 Grid 59	40206 Grid 60	40153 Grid 62	40130 Grid 68	40142 Grid 70	40051 Grid 83	40058 Grid 84	40014 Grid 86
	Upper 95% Confidence Level[1/]																				
Radionuclides (pCi/g)																					
Gross Alpha	–	12	13	14	29	19	31	15	22	19	18	19	24	96.7	35	299	23	17	36	27	41
Gross Beta	–	21	24	22	34	19	42.2	26.1	24.8	29.8	25.8	27.4	36.1	100.3	41.2	346	31.1	32.8	52.6	51.1	70.1
Cesium-137	0.92/0.0	–	–	–	–	–	–	–	–		–	–	–	–	–	–	–	–	0.47	–	**4.26**
Neptunium-237	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	**0.11**
Plutonium-238	–	–	–	–	–	–	**0.1**	**0.02**	**0.03**	**0.09**	**0.06**	**0.04**	**0.07**	**0.06**	**0.11**	**0.01**	**0.04**	**0.07**	**0.08**	**0.08**	**0.11**
Plutonium-239/240	–	–	–	–	–	–	–	**0.04**	**0.02**	**0.03**	**0.03**	**0.02**	**0.04**	**0.04**	**0.11**	**0.01**	**0.04**	**0.04**	**0.05**	**0.08**	**0.02**
Radium-226	1.564/1.318	–	1.05	–	0.9	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	**25.2**
Radium-228	1.363/1.607	0.53	0.86	0.76	0.92	0.68	0.88	0.94	1.09	1.0	–	1.11	–	0.97	1.03	–	0.93	1.25	1.3	1.3	**12.1**
Strontium-90	–	**0.28**	–	**0.47**	**0.59**	–	**0.35**	–	–	**0.74**	**0.16**	**0.19**	**1.8**	**0.66**	**0.67**	**0.16**	–	**0.65**	**0.33**	–	–
Technetium-99	–	–	–	–	**1.13**	–	–	–	–	–	–	–	**2.1**	–	**3.83**	**118.2**	**24.5**	–	**14.4**	–	**53.7**
Thorium, Total (ppm)	13.81/13.25	1.25	1.85	1.01	1.45	1.46	2.08	1.77	1.71	2.16	1.51	2.42	10.43	1.84	2.07	2.14	2.35	2.2	1.73	2.08	2.12
Thorium-228	1.56/1.475	–	–	–	–	–	1.11	1.18	0.92	1.02	1.16	1.22	**9.14**	0.79	1.17	1.22	1.25	1.42	1.04	0.96	1.25
Thorium-230	2.175/2.153	–	–	–	–	–	1.36	1.23	1.28	1.37	1.35	1.44	**8.13**	1.2	1.26	1.36	1.33	2.04	**4.07**	1.82	**5.72**
Thorium-232	1.519/1.458	–	–	–	–	–	1.13	0.97	0.93	1.18	0.82	1.32	**5.7**	1.01	1.13	1.17	1.29	1.2	0.94	1.13	1.16
Uranium, Total (ppm)	3.94/4.64	1.74	4.37	1.97	**32.4**	1.88	3.13	2.58	**8.93**	**8.2**	**6.22**	4.59	**24.5**	**159**[2/]	**27.1**	**655**	**5.9**	3.85	**49.8**[2/]	**14.5**[2/]	**40.6**
Uranium-234	1.353/1.061	–	–	–	–	–	1.34	0.77	**2.26**	**2.54**	**1.37**	1.33	**7.38**	**48.8**	**8.39**	**191.36**	**1.8**	**1.36**	**16.2**	**4.34**	**14.3**
Uranium-235/236	0.197/0.177	–	–	–	–	–	0.14	0.06	0.16	**0.2**	0.05	0.06	**0.5**	**2.43**	**0.48**	**11.2**	0.11	0.07	**0.85**	0.14	**0.63**
Uranium-238	1.293/1.533	–	–	–	–	–	**1.57**	0.9	**2.99**	**2.8**	**1.7**	**1.62**	**8.01**	**52.1**	**8.89**	**225**	**2.16**	1.33	**16.5**	**4.6**	**12.8**

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Table A-6. Post-excavation Grab Samples for HSL Organics, Mercury, and Cyanide.

Analyte	040443 Grid 8	040450 Grid 9	040379 Grid 20	040396 Grid 23	040347 Grid 26	040276 Grid 37	040288 Grid 39	040300 Grid 41	040269 Grid 48	040227 Grid 52	040175 Grid 55	040187 Grid 58	040199 Grid 59	040205 Grid 60	040153 Grid 62	040129 Grid 68	040141 Grid 70	040050 Grid 83	040057 Grid 84	040013 Grid 86
Volatile Organics (ppb)																				
1,1,1-Trichloroethane	–	**0.9 J/1 J**	–	–	–	–	–	–	–	–	–	–	–	–	5 BJ	4 BJ	5 BJ	5 BJ	5BJ/6BJ/7BJ	6 BJ
1,1-Dichloroethene	–	**110/92**	–	–	–	–	–	**72/77**	–	–	–	–	–	**9,700/12,000**	–	–	–	–	–	–
4-Methyl-2-pentanone	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Acetone	6 BJ	11BJ/9BJ/12B	9 BJ	–	7 BJ	–	**7 J**	–	15 B	–	19 B	**24**	–	–	–	–	–	–	–	–
Benzene	–	**56/62**	–	–	–	–	–	**52/53**	–	–	–	–	–	**9,100**	2 BJ	2 BJ	2 BJ	2 BJ	3 BJ	2 BJ
Bromomethane	–	–	–	–	–	–	–	–	–	–	–	–	–	**720 J**	–	–	–	–	–	–
Chloroform	–	–	–	–	–	–	–	**4 J/5 J**	–	–	–	**3 J**	–	**450 J**	–	–	–	–	**2 J**	–
Chlororbenzene	–	**55/61**	–	–	–	–	–	**59/60**	–	–	–	–	–	**8,900/9,000**	–	–	–	–	–	–
Ethylbenzene	–	–	–	**0.8 J**	–	–	–	–	–	–	–	–	–	**660 J**	–	–	–	–	**2 J**	–
Methylene Chloride	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Styrene	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	**1 J**	–
Tetrachloroethene	**1 J**	**0.8 J**	–	**1 J**	–	–	–	–	–	–	–	–	–	**48,000/49,000**	–	–	–	**2 J**	**2 J/3 J**	–
Toluene	–	**62/68**	**0.7 J**	**2 J**	**16**	**1 J**	–	**59/62**	**0.9 J**	**1 J**	–	–	**1 J**	**8,200/8,300**	–	–	–	–	**1 J**	–
Trichloroethene	–	**46/51**	–	–	–	–	–	**56/57**	–	–	–	–	–	**8,800/8,900**	–	–	–	–	–	–
Xylenes, Total	–	–	–	–	–	–	–	–	–	–	–	–	–	**2,000 J**	–	–	–	–	–	–
Inorganics (ppm)																				
Cyanide	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Mercury	–	**0.14**	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Pesticides/PCBs (ppb)																				
Aldrin	**17**	–	–	**20/20**	–	**1.6 JP**	–	–	–	–	–	–	**19/20**	–	–	–	–	–	**22/20**	–
alpha-Chlordane	**0.7 JP**	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Aroclor-1254	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	**40 J**	–	**130**
Dieldrin	**33/34**	–	–	**38/38**	–	**2.6 JP**	–	–	–	–	–	–	**38/41**	**0.55 JP**	–	–	–	–	**44/39**	**2.4 JP**
Endosulfan II	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	**2 JP**
Endosulfan sulfate	–	–	–	–	–	–	**0.73 JP**	–	–	–	–	–	–	–	–	–	–	–	–	–
Endosulfan-I	–	–	–	**1.4 JP/1.1 JP**	–	–	–	–	–	–	–	–	–	–	–	–	–	–	**0.5 JP**	–
Endrin	**35/36**	–	–	**44/42**	–	–	–	–	–	**0.84 JP**	–	**0.74 JP**	**41/43**	–	–	**0.94 JP**	–	**4.2**	**47/44**	**19**
Endrin aldehyde	–	–	–	–	–	–	–	–	–	–	–	–	**3.9 P**	–	–	–	–	–	–	–
Endrin ketone	**0.64 JP/0.83 JP**	–	–	**2.6 J**	–	–	–	–	–	–	–	–	**1.1 JP**	–	–	–	–	–	**0.85 J/0.8 J**	–
gamma-BHC (Lindane)	**16/17**	–	–	**21 P/21 P**	–	–	–	–	–	–	–	–	**19 P**	–	–	–	–	–	**21/20**	–
gamma-Chlordane	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	**0.89 JP**
Heptachlor	**16**	–	–	**19/18**	–	**1 JP**	–	–	–	–	–	–	**20/17**	–	–	–	–	–	**21/19**	–
Methoxychlor	21 B	–	–	–	**2.2**	–	–	–	–	–	**3.5 JP**	**0.85 J**	**1.3 JP**	–	1.2 BJ/1.7 BJP	2.2 BJP	3.3 BJP	1.8 BJ	–	13 BJ

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Analyte	040443 Grid 8	040450 Grid 9	040379 Grid 20	040396 Grid 23	040347 Grid 26	040276 Grid 37	040288 Grid 39	040300 Grid 41	040269 Grid 48	040227 Grid 52	040175 Grid 55	040187 Grid 58	040199 Grid 59	040205 Grid 60	040153 Grid 62	040129 Grid 68	040141 Grid 70	040050 Grid 83	040057 Grid 84	040013 Grid 86
Semivolatile Organics (ppb)																				
1,2,4-Trichlorobenzene	**1,100/1,000**	--	--	--	--	--	--	--	--	--	--	**860**	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	**1,200/1,100**	--	--	--	--	--	--	--	--	--	--	**860**	--	--	--	--	--	--	--	--
2,4-Dinitrotoluene	**1,500/1,500**	**930**	--	--	--	--	--	--	--	--	--	**1,600/1,700**	--	--	--	--	--	--	--	--
2-Chlorophenol	**1,800/1,700**	--	--	--	--	--	--	--	--	--	--	**1,600/1,800**	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	--	**380**	--	**400**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-Nitroaniline	--	--	--	**980**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,4'-DDT	**34**	--	--	**41/40**	--	**3 J**	--	--	--	--	--	--	**40/42**	--	--	--	--	--	**44/43**	--
4-Chloro-3-methylphenol	**1,600/1,500**	--	--	--	--	--	--	--	--	--	--	**1,600/1,700**	--	--	--	--	--	--	--	--
4-Nitroaniline	--	**930**	--	**980**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitrophenol	**2,300/1,900**	**930**	--	--	--	--	--	--	--	--	--	**2,000/2,200**	--	--	--	--	--	--	--	--
Acenaphthene	**1,200/1,100**	--	--	--	--	--	--	--	--	--	--	**1,400**	--	--	--	--	--	--	--	--
Anthracene	**4 J**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(g,h,i)perylene	--	**380**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
bis(2-Ethylhexyl)phthalate	--	**380**	--	--	--	39 BJ	--	--	59 BJ	87 BJ	68 BJ	54/60 BJ	56 BJ	70 BJ/65 J	--	--	--	--	--	--
Butyl benzyl phthalate	--	**380**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbazole	--	--	--	**400**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diethyl phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	**28 J**	--	--	--	--	--	--
Di-n-butyl phthalate	--	**380**	--	**38**	--	--	--	--	--	48 BJ	--	**21 J**	--	58 BJ	**28 J**	--	**22 J**	**17 J**	**26 J**	**20 J**
Di-n-octyl phthalate	--	**380**	--	--	--	--	--	--	--	--	--	**27 J**	100 BJ	--	--	--	--	--	**28 J**	--
Fluoranthene	**16 J/28 J/38 J**	**380**	--	--	--	--	--	--	--	--	--	--	--	**37 J**	--	--	--	--	--	**23 J**
N-Nitroso-di-n-propylamine	**1,200/1,000**	--	--	--	--	--	--	--	--	--	--	**1,200**	--	--	--	--	--	--	--	--
N-Nitrosodiphenylamine	--	**380**	--	--	--	**1,300**	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	**17 J**	--	--	--	--	--	--
p-Chloroaniline	--	--	--	**400**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	**1,600/1,500**	--	--	--	--	--	--	--	--	--	--	**1,300/1,800**	--	--	--	--	--	--	--	--
Phenanthrene	**7J/22 J/19J**	--	--	--	--	--	--	--	--	--	--	--	--	**39 J**	--	--	--	--	--	--
Phenol	**1,900/1,800**	--	--	--	--	--	--	--	--	--	--	**1,700/1,800**	--	--	--	--	--	--	--	--
Pyrene	**1,300/1,300**	--	--	--	--	**110 J**	--	--	--	--	--	**130 J/290 J**	--	**27 J**	--	--	--	--	--	**23 J**

Note: Duplicate and triplicate entries for sample tables indicate multiple analyses were performed. Dashes (--) indicate no detection.
This table indicates only those analytes detected. Positive dectections are shown in bold.
Laboratory Data Qualifiers:
B = Analyte found in associated blank.
J = The analyte concentration was detected at a level greater than the minimum detectable concentration, but deficiencies in data quality make the detection estimated.
P = This flag is used for pesticide/Aroclor target analyte when there is >25 percent difference for detected concentrations between the two GC columns. The lower of the two values is reported.